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THE

SCIENTIFIC AMERICAN

CYCLOPEDIA

OF

RECEIPTS, NOTES AND QUERIES.

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EDITED BY

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PREFACE.

For over fifty years the *Scientific American* has given its readers the experiences of practical experimenters in every branch of the useful arts. The formulas have been largely garnered from the columns of "Notes and Queries" and "Correspondence," which have for many years been widely read on account of their variety and value. This source of useful information, widely scattered and unclassified, has now been carefully brought together, digested and condensed. In addition, laborious researches have been made among the difficult and inaccessible mysteries known as "trade secrets." Many kindred works have been consulted, such as Cooley, Spon, etc., and acknowledgments are due for any formulas obtained from these sources. The success of this compilation is shown by the fact that in nine years twelve large editions have been issued. The publishers have now thought it desirable to bring out a revised edition in which the latest formulas could be given, as the changes in the last ten years, particularly in the line of such subjects as photography, have been very marked, and the Editor has been guided in this selection by thousands of letters from those who have used the book in its earlier editions.

A few hints as to the use of the work will not, perhaps, be out of place. It should be remembered that the working of a formula requires considerable skill, and it cannot be expected that the beginner can make articles at first which will compare with those on the market. The use of wrong raw materials is a fruitful source of trouble, and it should be remembered that a large number of articles called for in formulas cannot be obtained at the druggist's, although such materials can usually be purchased at wholesale chemical establishments in large cities. The use of impure materials, or materials which have deteriorated, is also a frequent source of error.

Want of care in following directions also causes the failure of the formulas to operate as intended. The quantities should be carefully measured, and where parts by weight are mentioned, all ingredients, whether solid or liquid, should be weighed. It should be remembered that acids, alcohol, etc., can be purchased of all strengths, and the use of materials not of the strength called for should be avoided. In case of non-success with a formula, readers are invited to communicate with the publishers, who will try as far as possible to assist them. It is hoped that the new edition will elicit as much commendation from the public as have the earlier ones.

New York, December, 1900.

THE SCIENTIFIC AMERICAN CYCLOPEDIA OF RECEIPTS, NOTES AND QUERIES.

Abbreviations.—The abbreviations used in this book are the ones usually accepted, and many of them will be found in the tables in the Appendix.

Signs and abbreviations used in medical prescriptions.

℞	Recipe. Take
aa	Ana. Of each
℔	Librum. Pound
ʒ	Uncia. Ounce
ʒ	Drachma. Drachm
℈	Scrupulus. Scruple
Cong.	Congious. Gallon
O.	Octarius. Pint
ƒ ʒ	Fluid Uncia. Fluid Ounce
ƒ ʒ	Fluid Drachma. Fluid Drachm
M.	Minimum. Minim
Chart.	Chartula. Small Paper
Coch.	Cochlear. Spoonful
Collyr.	Collirium. Eye Water
Decot.	Decoctum. Decoction
Ft.	Fiat. Make
Garg.	Gargarisma. Gargle
Gr.	Granum. Grain
Gtt.	Gutta. Drop
Haust.	Haustus. Draught
Infus.	Infusum. Infusion
M.	Misce. Mix
Mass.	Massa. Mass
Mist.	Mistura. Mixture
Pulv.	Pulvus. Powder
Q. S.	Quantum Sufficit. Sufficient Quantity
Sig or S.	Signa. Write
S. S.	Semis. Half
S. V.	Spirits of Wine
S. V. R.	Rectified " "
S. V. T.	Proof Spirit

Table showing the signs used in writing medical prescriptions.

½ grain	ss.
1 "	gr. j, or gr. i.
1½ "	gr. iss.
2 grains	gr. ii. or gr. ij.
2½ "	gr. iiss.
4 "	gr. iv.
8 "	gr. viii, or gr. viij.
½ scruple	℈ ss.
1 "	℈ i, or ℈ j.
1½ "	℈ iss.
2 scruples	℈ ii, or ℈ ij.
1 drachm	ʒ i, or ʒ j.
1½ "	ʒ iss.
2 drachms	ʒ ii, or ʒ ij.
3 "	ʒ iii, or ʒ iij.
3½ "	ʒ iiss.
7½ "	ʒ viiss.
½ ounce	℥ ss.
1 "	℥ i, or ℥ j.
1½ "	℥ iss.
½ pint	Oss.
1 "	O.

Abrasions.—When the scarf skin is abraded, the best and simplest application is a single layer of flexible collodion. If much epidermis has been lost and the part bleeds freely, a paste of equal parts of glycerine and subnitrate of bismuth may be laid on and covered with collodion.

Absinth. See **Liquors.**

Absorbent Cotton.—Boil best quality of cotton with 5 per cent solution of caustic soda or potash for one half hour. Wash thoroughly and press out all water as far as possible, and immerse in a 5 per cent solution of chloride of lime (bleaching powder) for 15 or 20 minutes; wash with a little water, then with water acidulated with hydrochloric acid, then with water. Boil once more for 15 minutes with caustic soda solution, and wash with acidulated and plain water as before.

Absorbent Powders. See **Powders.**

Abstergents.—In medicine and pharmacy, substances which cleanse or clear away foulness from the surface of the body or sores, as soaps, lotions, etc.

Academy Board. — *Smooth.* — Apply to junk board a coating of size; when dry, spread on thick paint with a pallet knife.

Rough.—Size heavy manila paper, apply to two sheets a thick coat of paint, place the painted sides together, then pull them apart. This will give the board a roughened surface or tooth.

Accidents, etc. See also **Drowning.**

Fainting.—At once make the patient lie down, with the head quite low. Loosen articles of dress. Let patient have plenty of air, and keep people from crowding round. Apply smelling salts, cautiously, to nose. Sprinkle face with a little cold water smartly. If faint continues long, or feet and hands are cold, apply hot bottles, and when patient can swallow, give a teaspoonful of sal volatile in water, or a little spirits in water.

Fits.—This means either apoplexy or epilepsy. Apoplexy is attended with insensibility. The patient falls, generally, but not always, grows purple in the face, and breathes in a snoring manner. There is paralysis of one side, and the mouth is drawn to one side. Place patient in bed, with head raised. If hot, apply cold water to head, and send for doctor.

In epilepsy, patient usually gives a scream, becomes deadly pale, falls on his face, becomes convulsed, and then profoundly insensible. While in this state, all that need be done is to loosen articles of dress, and keep patient quiet and beyond danger of hurting himself until sensibility returns. It is then a case for medical treatment.

Choking.—Choking arises from food, or fluids or other substances sticking in the throat or passing into the air passages. In bad choking, where the patient suddenly turns dark in the face, etc., no time is to be lost. Open the mouth, and push your forefinger in a determined way over the tongue, right back, and

try to hook away or push aside the hinderance. If this does not succeed, you may, by pressing the hinder portion of the tongue, bring on vomiting, and so secure relief. A good plan is sometimes tried with children, viz., that of pressing the chest and stomach against something hard, as a table or a chair, then slapping or thumping the back between the shoulder blades. In this way air is driven from the lungs through the windpipe so forcibly as often to expel the obstacle. When the obstruction consists of a coin, as often in the case of children, a good plan is at once to take the child up by the heels, and at the same time give it a shake or slap its back. Fish bones can sometimes be got rid of by swallowing a mouthful of bread. If these remedies fail, medical help should at once be called in.

Suffocation by Gases.—Drag the patient as quickly as possible into fresh air, loose clothing, dash cold water on head, face, and upper part of chest. If the breathing has stopped, artificial respiration must be resorted to.

Poisoning.—Send at once for the nearest doctor, telling him all the particulars, so that he may bring what is necessary. Unless the poison is an irritant, such as oil of vitriol or the like, which burns or destroys the stomach, etc., do all you can to make the patient sick. You may give a tablespoonful of mustard in a tumbler of warm water, or the same amount of common salt with warm water. If the patient is drowsy, as from poisoning by narcotics, you must do all you can to keep him awake by dashing cold water on his head and face, walking him about, etc. Do not permit him to sleep. In cases of poisoning by irritants, emetics should not be given, but you should try to save the stomach as much as possible by giving soothing drinks, as milk, etc. Always try to find out what the poison taken has been. You will generally be able to recognize a case of irritant poison, even if the patient cannot tell you, by the stains on the clothes, lips, etc., the burning sensation of the mouth, the terrible suffering of the stomach, the retching and vomiting of blood, etc. Medical advice must in any case of poison be called in with the utmost haste.—See **Poisons** for tables of antidotes.

Poisoning by Alcohol, or Drunkenness.—Get the patient under cover as soon as possible. If insensible, rouse him by dashing cold water on the face. Endeavor to make the patient vomit. Rub the surface of the body with warm, dry cloths; wrap the patient in blankets; put hot water bottles to his feet, and do all you can to keep up the heat of the body, which is always lowered in the state of intoxication.

Broken Limbs.—The thing to be first done is to keep the limb quite steady till the surgeon comes. This is done by placing on each side of the broken limb whatever may be at hand, such as slips of wood, small pillows, an umbrella, the stock and barrel of a gun, or two walking sticks, or even firmly rolled straw, or pads of cotton wool, and retaining them in their position by one or two handkerchiefs, not tied too tightly. Never raise the patient *from* the ground until the nature of his injury has been ascertained, or some appliance has been made to prevent the movement of the broken limb. Then raise him, if possible, with the help of several persons, and, as it were, in one solid piece, all moving together, and keeping step in carrying. If a patient has to be carried home, let it be on a shutter, or a table, or a stretcher, on which he can lie flat, instead of being doubled up in a cab, as is often done It is from neglect of this simple rule that broken bones are often made to protrude through the flesh, simple being thus turned into compound fractures, attended by the risk of the limb being lost.

What to Do when Dress Catches Fire.—The following are the directions given in Dr. Robert's book on ambulance work: "If your own dress, throw yourself at once on the ground, so that the rising flames may not catch the upper part of your clothes nor burn your head and chest; roll about (so putting the flames out by pressure), and at the same time, if possible, wrap yourself up closely in a rug, hearth rug, blanket, table cloth, overcoat, or carpet, so as to smother the fire. Do not get up to call for assistance, but for that purpose crawl to the bell rope or door. If another person's dress, throw the person on fire down at once, wrap him or her up in a rug or something similar, or, if there is nothing at hand suitable, use your own coat, rolling the patient about in it, for the purpose of smothering the flames." A woman rendering help in this way must exercise great self-possession, and be careful not to get her own clothes entangled in the flames.

Acetate.—A salt containing, the acid-radical $C_2H_3O_2$.

Acetification.—The process by which wine or cider is turned into vinegar.

Acetone.—Pyro-acetic Spirit.—This is a colorless liquid, obtained by distilling some of the acetates. It is used chiefly as a solvent for resins, gums, and camphor.

Acidimeter.—An instrument for measuring the strength of acids.

Acidimetry.—This process is the converse of Alkalimetry. It signifies the estimation by means of a standard alkaline solution of the real saturating power of a commercial sample of any acid. For this purpose 270 gr. of the pure carbonate of soda, as prepared for standardizing the acid used in alkalimetry, are dissolved in 10,000 gr. measures of distilled water. 1,000 gr. measures of this will saturate exactly 20 gr. of sulphuric acid; 18·5 gr. of hydrochloric acid; 27 gr. of nitric acid; 30 gr. of crystalline acetic acid; 22·5 gr. of oxalic acid; 57 gr. of dry tartaric acid; 97 gr. of dry citric acid.

Acid Proof Cements. See **Cements.**

Acid Stains, to Remove. See **Cleansing.**

Acne, Treatment for.—1. Take rose water 3 oz., sulphate of zinc 1 dr.; mix. Wet the face with it, gently dry it, and touch it over with cold cream, which also gently dry off.

2. Pay strict attention to diet and habits of life, avoid rich, highly seasoned, indigestible foods, take ordinary tonics, and especially arsenic. The most efficient local application is a saturated solution of boric acid in alcohol, washing the face but once a day in warm water. Dry with a soft towel and apply the solution. This (the boric acid solution) may be applied three or four times daily. Rochelle salts in water are also a good external application.

Actinometer.—This is an instrument for measuring the intensity of light. It is of great use in photography in carbon printing.

Adhesion of Materials, to Prevent.—To prevent oilcloth, patent leather, and similar materials from sticking together when rolled, purchase a few sheets of paraffine-impregnated paper, and roll with the material. This will prevent the sticking. It will also prevent the fading of the colors or gloss by keeping out air and moisture; the evaporation of the oil is likewise prevented to a great extent.

Aerugo.—The rust of brass, bronze, or copper; verdigris; patina.

Affusion.—In chemistry, the washing of a precipitate, for the purpose of removing soluble matters.

Agar-agar.—A yellow sea-weed produced

on the coasts of the Malay Archipelago. It resembles Iceland and Irish moss in its properties.

Agate, to Polish. See **Polishing.**

Agglutination.—The cohesion of bodies.

Aich's Metal. See **Alloys.**

Air.—The following data are useful in calculations relating to air:

1. To find the quantity of nitrogen by volume corresponding to 1 volume of oxygen, multiply by 3·770992.

2. To find the quantity of oxygen by volume corresponding to 1 volume of nitrogen, multiply by 0·265182.

3. To find the quantity of nitrogen by weight corresponding to 1 part by weight of oxygen, multiply by 3·313022.

4. To find the quantity of oxygen by weight corresponding to 1 part by weight of nitrogen, multiply by 0·301839.

5. To find the quantity of nitrogen by volume corresponding to 1 part by weight of oxygen, multiply by 2·6365411.

6. To find the quantity of oxygen by volume corresponding to 1 part by weight of nitrogen, multiply by 0·2730071.

7. To find the quantity of nitrogen by weight corresponding to 1 part by volume of oxygen, multiply by 3·6629154.

8. To find the quantity of oxygen by weight corresponding to 1 part by volume of nitrogen, multiply by 0·3792848.

Air, to Test for Sewer Gas.—Saturate unglazed paper with a solution of 1 oz. of pure lead acetate in half a pint of rain water; let it partially dry, then expose in the room suspected of containing sewer gas. The presence of the latter in any considerable quantity soon darkens or blackens the test paper.

Alabaster.—A soft, white, calcareous stone, much used in Italy for making ornaments. Volterra is the seat of the industry.

Alabaster, to Bronze. See **Bronzing.**

Alabaster, to Cement. See **Cements.**

Alabaster, to Clean. See **Cleansing.**

Alabaster, to Etch. See **Etching.**

Alabaster, to Stain. See **Staining.**

Alabaster, to Turn. — Alabaster is wrought, turned or fashioned in the same manner as marble. The tools resemble those employed in like operations in ivory and brass. Machinery is used to a large extent.

Alaska Scenery.—Dissolve 456 gr. of lead nitrate in 6 fluid oz. of water; if the solution is turbid, filter it. Place the solution where it is intended that it shall remain, and drop into it 200 gr. of sal ammoniac, in long fibrous crystals. The result is "Alaska scenery."

Albata Metal. See **Alloys.**

Albumen.—An organic nutritive principle, is a constituent of all animal fluids and solids. The white of eggs contains 12 per cent. of albumen, and the fluid portion of blood (serum) 7 per cent. It occurs also in the flesh, in the brain, and more or less in all serous fluids. Fibrin also may be regarded as coagulated albumen. It occurs in the vegetable kingdom, in the sap or juice of many plants, such as the potato, turnip, carrot, cabbage, in the green stem of peas, in the seeds of the cereal grasses, and in many nuts.

Albumen Paper. See **Photography.**

Albumen, Tests for.—1. A solution of bichloride of mercury dropped into a fluid containing albumen occasions a white precipitate. *Sensibility*, $\frac{1}{2000}$. (Bostock.)

2. Tannin or tincture of galls gives a yellow, pitchy precipitate.

Alcarazza.—Spanish water coolers. These are made of porous earthenware, and cool water by their copious evaporation of the water, which filters through.

Alcarazzas, Compositions for. See **Compositions.**

Alcohol.—*Alcohol*, as the term is generally understood, may signify spirits of various strengths, and we distinguish, therefore, between alcohol of 60, 70, 80 per cent., etc., meaning that in 100 volumes of the spirit there are contained 60, 70 or 80 volumes of absolute alcohol. As used in the U. S. Pharmacopœia the term alcohol is meant to designate that which contains 91 per cent. by weight of absolute alcohol and 9 per cent. of water.

Absolute Alcohol is alcohol without any water whatever, and, as it absorbs water from the atmosphere with great energy, it can scarcely be obtained in commerce. What is sold for absolute alcohol is rarely above 98 per cent. Absolute alcohol has a specific gravity of 0·7939 at 60 degrees F.

Spirits of Wine is the stronger alcohol that is generally found in commerce, and contains about 90 per cent. of alcohol and 10 per cent. of water. It derives its name from the fact that it was first obtained from the distillation of wine. The strongest commercial alcohol is about 95 degrees.

Rectified Spirits are spirits rendered purer and stronger by redistillation.

Cologne Spirits is the highest grade of alcohol, having been so purified as to be devoid of all color and odor.

Proof Spirits or Diluted Alcohol.—Proof spirits are defined by the United States laws as spirit containing (in 100 volumes) 50 volumes of absolute alcohol of sp. gr. 0·7939 and 53·71 volumes of water (the apparent excess of 3·71 vol. being lost by shrinking upon mixing the alcohol and water). Its specific gravity is 0·93353 at 60 degrees F. The government hydrometers for examining spirits are so graduated that they indicate (at 60 deg. F) 0 in pure water and 200 in absolute alcohol; in proof spirits they sink to 100. A spirit is said to be "10 above proof" or "110 proof" when the hydrometer indicates 110, and such spirit contains 55 per cent. of absolute alcohol. A modification of this hydrometer is the alcoholometer, which is graduated to show 0 in pure water and 100 in absolute alcohol; each division of that instrument thus indicates 1 per cent. of alcohol and the number of the division is directly equal to the volumetric percentage of absolute alcohol in the spirit. The diluted alcohol, as the term is used in the U. S. Pharmacopœia, is that containing 53 per cent. by volume of absolute alcohol (or about 45·5 per cent. by weight), and has a sp. gr. of 0·920.

Wood Spirits or Methyl Alcohol is a spirit obtained among other products from the destructive distillation of wood.

Methylated Spirits.—Spirits of wine mixed with 10 per cent. of commercial wood spirits. Proportion of alcohol in 100 parts of the following liquors: Scotch whisky, 54·32; Irish whisky, 53·9; rum, 53·68; brandy, 53·39; gin, 51·6; port, 22·9; Madeira, 22·27; currant, 20·55; Teneriffe, 19·79; sherry, 19·17; claret, 15·1; champagne, 13·8; gooseberry, 11·84; elder, 8·79; ale, 6·87; porter, 4·2; cider, 9·8 to 5·2.

Alcohol, to Deodorize.—1. Add to the barrel of alcohol a gallon of water saturated with chlorine gas; agitate thoroughly, let rest for twelve hours, then saturate with chalk (which, combining with the chlorine, forms chloride of lime) and distill. Filtering through animal charcoal after precipitating the chlorine with the chalk affords a very fair substitute for the redistilled alcohol. The fusel oil can be separated from alcohol, in small quantity, by adding a few drops of olive oil and thoroughly agitating in a bottle and allowing it to settle, and then decant. The olive oil combines with and retains the fusel oil.

2. Alcohol employed in perfumery should be free from all smell of fusel or other oils. Atwood's (patent) alcohol is deodorized by distil-

lation over permanganate of potassa. Spirits of wine, brandy, and alcohol distilled over soap lose their empyreumatic odor and taste entirely. At about 215 degrees F., the soap retains neither alcohol nor wood spirit. The empyreumatic oil which remains in combination with the soap which forms the residuum of the distillation is carried off at a higher temperature by the watery vapor, which is formed during a second distillation, the product of which is a soap free from empyreuma, and is fit to be used again for similar purposes. The concentration of the alcohol increases in this operation more than when the soap is not employed, because this compound retains the water, and the alcoholic vapors which pass over are more concentrated. Thirty-three pounds of soap are enough for one hundred gallons of empyreumatic brandy; and direct experiment has shown that, under the most favorable circumstances, the soap can retain 20 per cent. of empyreumatic oil. The soap employed should contain no potassa; it should be hard or soda soap, and ought to be completely free from any excess of fatty acids or fluids, otherwise it may render the product rancid or impure. Common soap, made with soda and oleine, has satisfied all the conditions in practice. If this soap is employed, it is better to add a little soda during the first distillation.

Caustic Alcohol.—This term is commonly applied to sodium ethylate, a product formed by the decomposition of absolute alcohol with pure metallic sodium, the chemical formula being $C_2 H_5$. Na O, or alcohol which has had one atom of its hydrogen replaced by one of sodium.

Moss Alcohol.—Large quantities of alcohol are distilled in Sweden and Russia from reindeer moss (*Cladonia* [*Cenomyce*] *rangiferina*) and Iceland moss (*Cetraria islandica*). The yield is said to be as great as from good grain, while the supply of material is abundant and cheap.

Alcohol, Wood.—It is obtained, mixed with pyroligneous acid (crude wood vinegar), from the destructive distillation of wood. When this is heated in a still, the first portions distilling are impure wood spirit. This purified by several rectifications (redistillations) yields common wood naphtha. The empyreumatic matters, acetone, etc., which it contains may be removed by heating it in a still over a water bath with an excess of chloride of calcium, as long as volatile matters escape (impurities), then distilling the remainder with a quantity of water equal to the spirit taken. Rectification of this dilute spirit over lime yields pure wood naphtha—methylic alcohol. See **Methyl.**

Alcoholate.—A salt in which alcohol appears to replace the water of crystallization, as is the case with certain chlorides, nitrates, etc. Some of them may be formed by simple solution and crystallization of the salt in alcohol (Graham). They are all very unstable, being readily decomposed by water.

Alcoholometer.—An instrument for determining the strength of alcohol or alcoholic solutions.

Alfenite. See **Alloys.**

Algarobillo.—An astringent matter found in the pods of a South American tree, *Balsamo carpum crevifolium*. It contains 68 per cent. of tannin, and is recommended as a material for the preparation of pure tannin.

Algiers Metal. See **Alloys.**

Alkalimetry.—Is the determination of the quantity of real alkali in alkaline salts and solutions. As in the case of acidimetry, the determinations may be made either by gravimetric or by volumetric analysis.

Gay-Lussac's method is based upon a titrated solution of carbonate of soda with a corresponding solution of sulphuric acid.—*Workshop Receipts.*

Alkanet.—The root of *Anchusa tinctoria*. It contains a large amount of red coloring matter, which has received the names alkanine and anchusine, and which is insoluble in water, though soluble in alcohol, and in the fatty and essential oils.

Alkermes. See **Liquors.**

Allotropic.—The name given to substances which exist in two or more forms, the chemical composition being the same. Thus some substances, even though they are in a gaseous state, can exist in two forms—oxygen and ozone.

Alloys, to Electro-plate with. See **Electro-Metallurgy.**

Alloys.—An alloy is a combination of two or more metals. It is now largely believed that the metals form combinations rather than mixtures, though one of the best metallurgists in England called his book on alloys "Mixed Metals." Hiorn's definition of an alloy, from "Mixed Metals," is given below:

"*Nature of Alloys.*—When two or more metals are caused permanently to unite, the resulting mixture is termed an alloy. When mercury is an essential constituent, the mixture is termed an amalgam. The general method of effecting combination is by the agency of heat, but with certain soft metals true alloys may be formed by subjecting the constituents to considerable pressure, even at the ordinary temperature. Alloys such as those briefly referred to were doubtless first discovered by the metallurgical treatment of mixed ores, from the simultaneous reduction of which alloys would be formed: or in some cases, as in ores of gold and silver, naturally formed alloys would be obtained by a simple melting process. The direct preparation of alloys by the simple melting together of the constituent metals has been enormously developed in modern times, and the attention which mixed metals are now receiving by chemists is far greater than in any period of history. Comparatively few of the metals possess properties such as render them suitable to be employed alone by the manufacturer; but most of them have important applications in the form of alloys. Even among the metals which can be used independently, it is often found expedient to add portions of other metals, to improve or otherwise modify their physical properties. Thus gold is hardened, and made to resist wear and tear, as well as to lower its cost, by the addition of copper; silver is likewise hardened by alloying it with copper; and the bronze coinage is formed of an alloy of copper, zinc and tin for similar reasons."

[For a large number of the receipts and compositions we are indebted to this admirable little work.]

Acid-resisting Alloy.—Mr. Rettz has invented an alloy which offers great resistance to the action of acids and alkalies. It has the following composition: Copper, 15 parts; tin, 2·34 parts; lead, 1·82 parts; antimony, 1 part. It is said to be a useful substitute, in laboratories, for ebonite and porcelain.

Aich's Metal.—This alloy is analogous to sterro metal, and shows similar variations in composition from various analyses that have been made. Its chief properties are hardness and tenacity, the same remarks applying to this as to sterro metal, with which it is practically identical. Alloys under this name contain from 0·4 to 3·0 per cent. of iron. It has a golden-yellow color, and is recommended for articles exposed to sea water. The following analyses will give an idea of the composition:

Copper.....	60·66	60	60·2	58·26
Zinc.....	36·58	38·2	38·2	41·00
Tin.....	1·02			
Iron.....	1·74	1·8	1·6	0·74

Table of Alloys.

The following is a table of the proportions of the various metals in the alloys most commonly employed in the arts and manufactures. The term "parts" means parts by weight. The abbreviations are: Cu, copper; Zn, zinc; Sn, tin; Pb, lead; Sb, antimony; P, phosphorus; As, arsenic; Ni, nickel.

Description.	Cu.	Zn.	Sn.	Pb.	Sb.	P.	As.	Ni.
1.) Metal for frictional parts of locomotives (extremely hard)	87	5	8					
(2.) Bearings of carriages	97	3						
(3.) Bearings of driving wheels, also for steam engine whistles, giving a clear sound	80	2	18					
(4.) Steam engine whistles giving a deep sound	81	2	17					
(5.) Cross heads of connecting rods	82	2	16					
(6.) Cylinders of pumps, valve boxes, and taps	88	2	10					
(7.) Eccentric collars	84	2	14					
(8.) Bearings of axles and trunnions; eccentric collars	84 85 84 68	2 2 7 4	14 13 9 28					
(9.) Pistons of locomotives	88 84	9 8·4	3 2·9	4·7				
(10.) Axle boxes	88	2	10					
(11.) Mathematical instruments, arms of balances	90	2	8					
(12.) Machinery, bearings, etc.	67		14	19				
(13.) Steam engine whistles	30		18		2			
(14.) Metal to withstand friction (Stephenson)	79	5	8	8				
(15.) Rivets	64	24·6	3	9				
(16.) Metal for coffins	15		40	45				
(17.) Metal to withstand friction	2		72		26			
(18.) Cylinders of pumps	7	72	21					
(19.) Metal for bearings of locomotives	2		90		8			
(20.) White brittle metal (for buttons, etc.)	10	6	20		64			
(21.) Imitation silver	64		3					
(22.) Pinchbeck	5	1						
(23.) Tombac	16	1	1					
(24.) Red tombac	10	1						
(25.) Specially adapted for bearings	83		15·5		1·5			
(26.) For bearings and valves	83·25		7	9		0·75		
(27.) Electrotype "backing metal"			4	91	5			
(28.) Stereotype metal for paper process				88	12			
(29.) " " " plaster process				82	18			
(30.) Bullet metal				92			2	
(31.) Malleable brass plate	67	33		0·5				
(32.) Pin wire	67	33	0·5	0·5				
(33.) Jemmapes brass	64·6	33·7	0·2	1·5				
(34.) Similor for gilding	92·7	4·6	2·7					
(35.) Maillechort for rolling	60	20						20
(36.) " first quality	8	3						4
(37.) White similor	7						0·5	
(38.) For stopcock seats			86		14			
(39.) " plugs			80		20			
(40.) For keys of flutes, etc.				20	40			
(41.) Hard tin			1		0·5			
(42.) White tombac	75		25					
(43.) Vogel's alloy for polishing steel	8	1	2	1				
(44.) Rompel's anti-friction metal	62	10	10	18				
(45.) Arguzoid, a tough alloy superior to brass	56	23	4	3½				13½

Albata Metal.—Copper, 40 lb.; zinc, 32 lb.; nickel, 8 lb.

Alfenide.—Copper, 60 per cent.; zinc, 30 per cent.; nickel, 10 per cent.; iron, a trace.

Algiers Metal.—1. 90 tin, 10 antimony; 2. 94·5 tin, 5 copper, 0·5 antimony. 1 is used for spoons and forks, 2 for small hand bells.

Aluminum and Tin.—1. Aluminum, 100 parts; tin, 10 parts.

2. Aluminum, 90 per cent.; tin, 10 per cent.

Bourbonne's Aluminum Alloy.—Aluminum and tin, equal parts. This alloy solders easily.

Aluminum Bronze.—100 parts copper and 10 aluminum, measured by weighing, when combined, is a durable alloy, which may be forged and worked in the same manner as copper, and is the same color as pale gold. 80 parts copper, 19 zinc, and 1 aluminum form a good durable alloy.

Aluminum Silver.—The following alloy takes a high silver polish, and exhibits a beautiful silvery color: Copper, 70 parts; nickel, 23 parts; aluminum, 7 parts.

Belgian Antifriction Metal.—For parts exposed to much friction, 20 parts copper, 4 of tin, 0·5 of antimony, 0·25 lead. For parts subjected to great concussions, 20 parts copper, 6 zinc, 1 tin. For surfaces exposed to heat, 17 parts copper, 1 zinc, 0·5 tin, 0·25 lead. In making these alloys, mix all the other ingredients before adding the copper.

Antifriction Metal.—Tin 16 to 20 parts; antimony 2 parts; lead 1 part; fused together and then blended with copper 80 parts. Used where there is much friction or high velocity.

2. Zinc 6 parts; tin 1 part; copper 20 parts; Used when the metal is exposed to violent shocks.

3. Lead 1 part; tin 2 parts; zinc 4 parts; copper 68 parts. Used when the metal is exposed to heat.

4. (Babbitt's.) Tin 48 to 50 parts; antimony 5 parts; copper 1 part.

5. (Fenton's.) Tin with some zinc and a little copper.

6. (Ordinary.) Tin, or hard pewter with or without a small portion of antimony or copper. Without the copper it is apt to spread out under the weight of heavy machinery. Used for the bearings of locomotive engines, etc.

Argasoid or Argusoid.—A new alloy called "argasoid," recently described by Mr. V. Jeuptner, of Vienna, has been used as a substitute for silver. Its cost is said to be about fifty per cent. more than brass. Its chemical composition is as follows: Tin, 4·035; lead, 3·544; copper, 55·780; nickel, 13·406; zinc, 23·198; iron, trace.

White Argentan.—Zinc, 70 parts; copper, 15 parts; nickel, 6 parts.

Argentin.—85·5 tin, 14·5 antimony; suitable for spoons and forks.

Argent-Ruolz.—Silver, 20 parts; copper, 50 parts; nickel, 30 parts; the proportions of the metals differ according to the quality of the metal.

Argiroide.—Variety of German silver. Usually plated.

Ashberry Metal.—78 to 82 tin, 16 to 20 antimony, 2 to 3 copper.

Babbitt's Attrition Metal.—Preparing and fitting, melt separately 4 lb. of copper, 12 lb. best quality Banca tin, 8 lb. regulus of antimony, and 12 lb. more of tin while the composition is in a melted state. Pour the antimony into the tin, then mix with the copper away from the fire in a separate pot.

In melting the composition, it is better to keep a small quantity of powdered charcoal on the surface of the metal. The above composition is called "hardening." For lining the boxes, take 1 lb. of hardening and melt it with 2 lb. of Banca tin, which produces the lining metal for use. Thus the proportions for lining metal are, 4 lb. of copper, 8 lb. of regulus of antimony, and 96 lb. of Banca tin.

Babbitt Metal.—By weight 4 parts copper, 8 parts antimony, 96 parts tin.

Bath Metal.—A species of brass having the following composition: 1. Zinc, 3 parts; copper, 16 parts; melted together under charcoal. 2. Fine brass, 32 parts; spelter, 9 parts.

Baudoin's Alloy.—Copper, 72 parts; nickel, 16·6 parts; cobalt, 1·8 parts; zinc, 7·1 parts. About 0·5 per cent of aluminum may be added.

Bearings suitable for Alloys.

	Copper.	Tin.	Zinc.
Ordinary bearings	84·5	13·3	2·2
" "	83·6	12·6	3·8
Heavy "	84	12	4
" "	77	9	14
Main "	75	4	21
Locomotive axles	86	....	14
" "	82	10	8
Moderately hard axles	70	22	8
Hard axles	82	16	2
Very hard axles	89	....	11

See also *Brass* and *White Metal.*

Bell Metal.—The various alloys used in the manufacture of bells consist essentially of copper and tin, but in some cases other metals are added in small quantity either for cheapness or to produce a desired quality of sound. The additional metals chiefly used are zinc, lead, iron, and sometimes bismuth, silver, antimony, and manganese. The following table will show a few of the proportions employed:

	Copper.	Tin.	Zinc.	Lead.	Iron.	Silver.	Bismuth.	Antimony.
Musical bells	84	16	....	....	....	....	....	
Sleigh bells	84·5	15·4	....	....	....	....	....	0·1
Gongs	82	18	....	....	....	....	....	....
House bells	80	20	....	....	....	....	....	....
House bells	78	22	....	....	....	....	....	....
Large bells	76	24	....	....	....	....	....	....
Swiss clock bells	74·5	25	....	0·5	....	....	....	....
Old bell at Rouen	71	26	1·8	1·2	....	....	....	....
Clock bells	72	26·56	....	....	....	1·44	....	....
Alarm bell at Rouen	75·1	22·3	1·0	....	....	1·6	....	....
Tam-tam	79·0	20·3	....	0·52	....	0·18	....	....
Japanese kara kane	64	24	9	....	3	....	....	....
Japanese kara kane	70	19	3	8	....	....	....	....
Japanese kara kane	61	18	6	12	3	....	....	....
White table bells	17	80	....	....	....	....	3	....
White table bells	....	87·5	....	....	....	....	....	12·5
Small bells	40	60	....	....	....	....	....	....

Prep.—1. Melt together, under powdered charcoal, 100 parts of pure copper with 20 parts of tin, and unite the two metals by frequently stirring the mass. *Remark:* Product very fine.

2. Copper, 3 parts; tin, 1 part, as above. *Remark:* Some of the finest church bells in the world have this composition.

3. Copper, 72 parts; tin, 26½ parts; iron, 1½ parts. *Remark:* The bells of small clocks or pendules are made of this alloy in Paris.

Bell Metal, Fine.—71 copper, 26 tin, 2 zinc, 1 iron.

Bell Metal, for Large Bells.—Copper, 100 lb.; tin, from 20 to 25 lb.

Bell Metal, for Small Bells.—Copper, 3 lb.; tin, 1 lb.

Alloy for Tam-tams or Gongs.—80 parts of copper and 20 of tin, hammered out with frequent annealing. An alloy of 78 of copper and 22 of tin answers better and can be rolled out.

Kara Kane Bell Metal.—The Japanese, who are great bronze workers, add lead, zinc, and iron to their bell metal, with wonderful effect. Their name for these compounds is *kara kane*. The following are the proportions they use:

Copper.	Tin.	Zinc.	Lead.	Iron.	Quality.
60	24	9	....	3	First.
60	15	3	8	...	Second.
60	18	6	12	3	Third.

For small bells they employ the first quality and for large bells the third quality.

Bibra's Alloy.—Bismuth, 18 parts; tin, 9 parts; lead, 38 to 40 parts.

Bidery, Vidry.—An alloy of which the chief seat of manufacture is the city of Bider, near Hyderabad, India.

Many articles made of it were greatly admired at the International Exhibition of 1851. Its color is between that of pewter and zinc, does not corrode by exposure to air or damp, and can only be broken by extreme violence. Zinc, 31 parts; copper and lead, each 2 parts; melted together with the usual precautions under a mixture of resin and beeswax, to prevent oxidation.

2. (Dr. Heyne.) Copper, 3 parts; lead, 2 parts; tin, 1 part; melted as before. For use the resulting alloy is remelted, and to every 3 parts of it 16 parts of zinc are added.

Bobierre's Metal.—This is ordinary brass, consisting of 66 parts copper and 34 parts zinc. Bobierre introduced this alloy as especially suitable for ships' sheathing.

Bristol Brass.—Copper, 61 per cent.; zinc, 39 per cent.

1. *Fine Brass.*—2 parts of copper to 1 part of zinc. *Remarks*: This is nearly 1 equivalent each of copper and zinc, if the equivalent of the former metal be taken at 63·2; or 2 equivalents of copper to 1 equivalent of zinc, if it be taken, with Liebig and Berzelius, at 31·6.

2. Copper 4 parts, zinc 1 part. An excellent and very useful brass.

3. *Gold-colored Brass. – Syn.* Red brass, Dutch gold, tombac, similor, Prince's metal, pinchbeck, etc.

4. Copper and zinc, equal parts.

5. Copper, 2 parts; zinc, 1 or 1½ parts. This is Manheim gold.

6. Copper, 3 to 5½ parts; zinc, 1 part. Deep colored.

Remarks.—The proportion of zinc in this alloy is altered to suit the color and other properties to the purposes for which it is intended, and often varies from ½ to ⅓ or ¼ of the weight of the alloy. At the celebrated works of Hegermühl, near Potsdam, the proportions are 11 parts of copper to 2 of zinc, which pro-

Brass.—Table of Various Copper-Zinc Alloys.

	Name.	Authority.	Copper	Zinc.	Tin.	Lead.	Iron.
1.	Brass, English	Lavater	70·29	29·26	0·17	0·28	.....
2.	" Heegermuhl	"	70·16	27·45	0·79	0·2	.....
3.	" Augsburg	"	70·89	27·63	0·85	.....	.....
4.	" Neustadt	Kadernatsch,	71·36	28·15	.....	.....	.....
5.	" Romilly	Chaudet	70·1	29·9	.....	.....	.....
6.	" unknown	Karsten	71·5	28·5	.....	.....	.....
7.	" "	Regnault	71·0	27·6	trace	1·3	.....
8.	" "	Chaudet	61·59	35·33	0·25	2·86	.....
9.	" Stolberg	"	65·8	31·8	0·25	2·15	.....
10.	Watch wheels	Faisst	60·66	36·88	1·35	.....	0·74
11.	" "	"	66·06	31·46	1·43	.....	0·88
12.	Ship nails, bad	Percy	52·73	41·18	.....	4·72	.....
13.	" good	"	62·62	24·64	2·64	8·69	.....
14.	Tombac, English	Faisst	86·38	13·61	.....	.....	trace
15.	" German	Karsten	84·0	15·5	.....	.....	.....
16.	Coin of Titus Claudius	Giraldin	81·4	18·6	.....	.....	.....
17.	" " " 79 A. D.	Phillips	83·04	15·84	.....	.....	0·5
18.	" " Hadrian, 120 A. D.	"	85·67	10·83	1·14	1·73	0·74
19.	" " Faustina, jun., 165 A. D.	"	79·15	6·67	4·97	9·18	0·23
20.	Antique bracelet, Naumberg	Goebel	83·08	15·38	1·54	.....	.....
21.	Statue of Louis XIV	D'Arcet	91·40	5·53	1·7	1·37	.....
22.	" " Napoleon	"	75	20	3	2	.....
23.	Brass for gilding	"	82	15·5	2·5	.....	.....
24.	"	"	64·5	32·5	2·5	.....	.....
25.	"	"	82	15	3	.....	.....
26.	"	"	78	20	2	.....	.....
27.	Brass, color pale yellow	König	82·33	16·69	.....	.....	.....
28.	" " deep yellow	"	84·5	15·3	.....	.....	.....
29.	" " red yellow	"	90	9·6	.....	.....	.....
30.	" " orange	"	98·93	0·73	.....	.....	.....
31.	" " copper-red	"	99·9	.....	.....	.....	0·08
32.	" " violet	"	98·22	0·5	trace	.....	trace
33.	" " green	"	84·32	15·02	"	.....	0·3

Some Varieties of Modern Brass.

Name.	Color.	Copper	Zinc.	Tin.	Lead.	Iron.	Gold.
1. Jewelers' gilding alloy	Red	94	6				
2. " " "	"	90·5	7·9		1·6		
3. Pinchbeck	Reddish yellow	88·8	11·2				
4. Orëide (French gold)	"	90	10				
5. Talmi gold	Gold	90·70	8·33				0·97
6. Tissier's metal with one per cent. of arsenic	Red	97	2				
7. Tournay's alloy	Yellow	82·54	17·46				
8. Rich sheet brass	"	84	16				
9. Bath metal, similor, etc	"	80	20				
10. Dutch alloy	"	76	24				
11. Bristol sheet brass	Bright yellow	72·8	27		0·2		
12. Brass wire	" "	70	30				
13. Prince's metal	Yellow	75	25				
14. Sheet and wire brass	Full yellow	67	33				
15. Mosaic gold, ordinary brass	"	66·6	33·3				
16. Bobierre's metal	"	66	34				
17. Muntz' metal	"	62	38				
18. " "	"	60	40				
19. Gedge's metal	"	60	38·5			1·5	
20. Common brass	"	64	36				
21. Aich's metal	"	60	38·2			1·8	
22. French brass (Potin jaune)	Gray yellow	71·9	24·9	1·2	2·0		
23. Hamilton's metal, chrysorin	Full yellow	64·5	32·5	0·3	2·7		
24. French brass for fine castings	"	71	24	2	3		
25. Sterro metal		55·5	42			2·5	
26. Hard solder for copper or iron		57	43				
27. " " " brass		50	50				
28. Dipping brass		53	47				
29. White brass		34	66				
30. Lap alloy		12·5	87·5				

duces a metal which is afterward rolled into sheets for the purpose of making Dutch leaf-gold.

Brass, Button.—1. (Best.) Copper, 8 parts; zinc, 5 parts, as above.

2. (Common.) Copper, 50 parts; zinc, 40 parts; tin, 4 parts; lead, 6 parts.

3. Copper, 129 parts; zinc, 201 parts.

Best Red Brass, for Fine Castings.—Copper, 24 lb.; zinc, 5 lb.; bismuth, 1 oz. Put in the bismuth last, before pouring off.

Hard Brass, for Casting.—25 parts copper, 2 zinc, 4·5 tin.

Brasses, Machine.

	Copper.	Tin.	Zinc.	Lead.	Other Metals.
Eccentric rings	90	7·7	2·3	....	
" " "	66	15·5	18·5	....	
Pumps	84	7	9	....	
"	34	50	16	....	
Kingston valve	84·2	10·5	5·3	....	
Cocks and glands	81	3	13	3	
Paddle wheel pins	76·8	17·4	5·8	....	
Sluice cock way	81	....	19	....	
Propeller blades and boxes	57	14	29	....	
Hydraulic pumps	81	....	19	....	
Propeller shaft liner	80	5·4	14·6	....	
White metal bush for propeller	5	26	69	....	
Cog wheels	91	....	9	....	
Steam whistles	80	17	3	....	
Stuffing boxes	86	11	3	....	
Mechanical instruments	82	13	5	....	
Piston rings	84	2·9	8·3	4·8	
Stevenson's socket alloy	19	31	19	31	
Sterro metal for pumps	55	6	22·5	....	Iron 16·5
Valve balls	87	12	....	....	Antimony 1

	Bearing Brasses.	Eccentric Pumps.	Kingston Valve.	Paddle Wheel Pins.	Propeller Blades and Boxes.
Copper	56	28	112	56	16
Tin	8½	6½	14	12½	4
Spelter	2½	7½	....	3½	8
Old metal	45	70	7	40	84

	Heavy Bearings.	Heavy Bearings.	Main Bearings.	Propeller Shaft Liner.
Ingot copper	16	16	16	56
Block tin	2¼	3	2–3	6
Zinc	¾	....	....	....
Old brass	....	13	32	50

Hydraulic Pumps.

Ingot copper	14 lb.
Zinc	1½ "
Yellow brass	3½ "
Or spelter	1¾ "

White Metal Bush for Propeller Shaft.

Ingot copper	6 lb.
Tin	84 "
Spelter	32 "

The following tables represent the mixtures employed by a large engineering firm, using scrap and new metal:

	Bearing Brasses.	Eccentric Pumps.	Pumps.	Cocks and Glands.	Sluice Cock Way.
Copper	38	38	38	38	38
Spelter	1	1	4	6	9
Lead	.....	.....	.....	1½	.....
Tin	7	4	3	1½	.....
Old metal	54	57	55	53	53

See, also, *Bearings*, above.

Rolled Brass.—32 copper, 10 zinc, 1-5 tin.

Sheet Brass, Compositions of.—

Copper.	Zinc.	Tin.	Lead.
92·7	4·6	2·7	..
91·6	8·4	..	..
90	10	..	..
85·5	14·5	..	..
83	17	..	..
79·5	20	..	0·5
76	24	..	..
75	25	..	..
73·5	26·2	0·3	..
70	30	..	..
68	32	..	..
67	32	0·5	0·5
66	34	..	..
65	35	..	..

Brass for Solder.—Syn. Hard Solder. 1. 12 parts of brass, 6 parts of zinc, and 1 of tin, melted together.

2. 2 parts of brass and 1 of zinc.

3. (Very strong.) 3 parts of brass and 1 of zinc.

Brass, Turner's.—98 parts of brass and 2 of lead. *Remarks.*—The addition of lead improves the brass for the use of the turner, but lessens its malleability.

Red Brass, for Turning.—Copper, 24 lbs.; zinc, 5 lbs.; lead, 8 oz. Put in the lead last, before pouring off.

Red Brass, free, for Turning.—Copper, 160 lbs.; zinc, 50 lbs.; lead, 10 lbs.; antimony, 44 oz.

Brass, for Turning.—Copper, 32 lbs.; zinc, 10 lbs.; lead, 1 lb.

Yellow Brass, for Turning.—(Common article.) Copper, 20 lbs.; zinc, 10 lbs.; lead, 1 to 5 oz. Put in the lead last, before pouring off.

White Brass.—Below I give proportions for various white brasses, as they are called. They can all be melted on a good hot fire; but a coke stove, in which you could get a slight blast, would be better still.

	1	2	3	4	5	6	7	8
Lead	70	—	42·5	37·5	—	—	—	84
Zinc	—	82	42·5	—	—	—	—	—
Tin	—	—	—	37·5	66·7	90	85	—
Antimony	20	11	15	25	11·1	7	10	16
Copper	10	7	—	—	22·2	3	5	—

Ordinary brass can, I have heard, be melted over an ordinary open fire; but I have never melted it so myself.

Brass for Wire.—For wire, an alloy of 72 parts copper, 28 zinc, is commonly used; this alloy must be afterward hardened by tempering.

Yellow Brass.—30 parts of zinc and 70 of copper in small pieces.

Britannia Metal.—

1. *Best Britannia*, for Spouts.—Tin, 140 lbs.; copper, 3 lbs.; antimony, 6 lbs.

2. *Best Britannia*, for Spoons.—Tin, 100 lbs.; hardening, 5 lbs.; antimony, 10 lbs.

3. *Best Britannia*, for Handles.—Tin, 140 lbs.; copper, 2 lbs.; antimony, 5 lbs.

4. *Best Britannia*, for Lamps, Pillars, and Spouts.—Tin, 300 lbs.; copper 4 lbs.; antimony, 15 lbs.

5. *Britannia*, for Casting.—Tin, 100 lbs.; hardening, 5 lbs.; antimony, 5 lbs.

6. *Good Britannia Metal.*—Tin, 150 lbs.; copper, 3 lbs.; antimony, 10 lbs.

7. *Britannia Metal*, Second Quality.—Tin, 140 lbs.; copper, 3 lbs.; antimony, 9 lbs.

8. *Britannia Metal*, for Casting.—Tin, 210 lbs.; copper, 4 lbs.; antimony, 12 lbs.

9. *Britannia Metal*, for Spinning.—Tin, 100 lbs.; Britannia hardening, 4 lbs.; antimony, 4 lbs.

10. *Britannia Metal*, for Registers.—Tin, 100 lbs.; hardening, 8 lbs.; antimony, 8 lbs.

11. *Hardening for Britannia.*—(To be mixed separately from the other ingredients.) Copper, 2 lbs.; tin, 1 lb.—*Workshop Receipts.*

Britannia Metal. Syn. Tutania.—A fine species of pewter.

Prep.—1. Melt together equal parts of plate brass, bismuth, antimony, and tin and add the mixture at discretion to melted tin, until it acquires the proper degree of color and hardness.

2. To the last add an equal part or 1-4 of its weight of metallic arsenic. To be used as before.

3. Melt together 1 part of antimony, 4 parts of brass, and 5 or more parts of tin. This may be used at once, as Britannia metal.—*Cooley.*

Bronze.—A metallic alloy, composed principally of tin and copper, remarkable for the exactness of the impressions which it takes by moulding, as well as its durability; and hence, extensively employed in the casting of busts, medals, and statues. Bell, cannon, and speculum metal are varieties of bronze. In ancient times, when the manufacture of steel was ill understood, cutting instruments were frequently made of this alloy. For statuary work, the great desideratum is to obtain an alloy capable of flowing freely into the most minute outlines of the mould, hard, and yet tough, and capable of resisting the corroding action of the weather. It must also acquire that peculiar antique green appearance that is so much admired in bronzes.

When only a small quantity of the alloy is required, it is prepared in crucibles, but for statues or larger works, on reverberatory hearths. The fusion of the mixed metals must be conducted under pounded charcoal, and as rapidly as possible. When melted, it must be frequently stirred together to produce a perfect mixture, before casting. Coal is the fuel principally employed for the furnaces.

Bismuth Bronze.—Tin, 16 parts; bismuth, 1 to 3 parts.

Fontainemoreau's Bronzes.—

Zinc.	Copper.	Cast Iron.	Lead.
90	8	1	1
91	8	0	1
92	8	0	0
92	7	1	0
97	2½	½	0
97	3	0	0
99½	0	½	0
99	1	0	0

Bronze Metal.—1. Copper, 7 lbs.; zinc, 3 lbs; tin, 2 lbs. 2. Copper, 1 lb.; zinc, 12 lbs.; tin, 8 lbs.

Bronze, for Mortars.—Copper, 93 parts; lead, 5 parts; tin, 2 parts. The edges and lips of mortars must be tempered by heating them to a cherry red, and then plunging them into cold water; as unless so treated, they are very apt to be broken.

Simple Bronzes.—Proportions and Results.

Copper.	Tin.	Color.	Description.
lb.	oz.		
1	0·5	Reddish yellow.	Ancient nails.
1	1·0	" "	Soft gun bronze.
1	1·3	" "	For mathematical instruments.
1	1·5	" "	For toothed wheels.
1	2·0	Yellow red.	Ordnance.
1	2·3	" "	Hard weapon and tool bronze.
1	2·5	" "	Hard machinery bearing bronze.
1	3·0	Bluish red.	Soft, for musical bells.
1	3·5	" "	" " gongs.
1	4·0	Ash gray.	" " house bells.
1	4·5	" "	" " larger bells.
1	5·0	Dark gray.	" " the largest bells.
1	7·0	Whitish.	Ancient mirrors.
1	8·0	Whiter.	Speculum bronze.
1	32·0	Whiter still.	Pewterers' temper.

Bronze for Statuary.—1. Copper, 88 parts; tin, 9 parts; zinc, 2 parts; lead, 1 part. 2. Copper, 88½ parts; tin, 5 parts; zinc, 10½ parts; lead, 2 parts. 3. Copper, 90 parts; tin, 9 parts; lead, 1 part. 4. Copper, 91 parts; tin, 9 parts.

For Medals.—1. Copper, 89 parts; tin, 8 parts; zinc, 3 parts. 2. Copper, 95 parts; tin, 5 parts.

For Cutting Instruments.—Copper, 100 parts; tin, 14 parts.

For Ornaments.—1. Copper, 82 parts; tin, 3 parts; zinc, 18 parts; and lead, 2 parts. 2. Copper, 83 parts; zinc, 17 parts; tin, 1 part; lead, ⅛ part.

Bullet Metal.—98 lead to 2 arsenic. For round shot the fused metal is dropped from a high elevation in a shot tower into a basin of water; or thrown down a stack of limited height, in which a strong draught of air is produced by a blower.

Alloys for Calico-printing Rollers and Scrapers.—For this purpose a metal is required that is sufficiently soft to be worked by tools and hard enough to resist the wear to which it is subjected in practice. Another important desideratum is that the metals should be capable of resisting the corrosive action of the liquids with which they are in contact. Hauvel considers a bronze having the following composition the best material for the rollers: copper, 84; tin, 14; zinc, 2. Another alloy which is used consists of zinc, 78·5; tin, 15·8; copper, 5·6. The following are analyses by Depierre and Spiral of the scrapers employed to remove the surplus color from the rollers:

	Copper.	Zinc.	Tin.
French scrapers	78·75	12·50	8·75
English "	80·50	11·50	8·00
German "	85·30	9·80	4·90

Calin.—The lining to tea chests is called calin. It is composed of 50 to 60 parts of lead; 8 parts of tin; ½ of copper, and a small percentage of zinc.

Chrysocale.—9 copper, 8 zinc, 2 lead.

Clark's Patent Alloy.—Copper, 75 parts; nickel, 14·5 parts; zinc, 7·5 parts; tin, 1·5 parts; cobalt, 1·5 parts.

Cliche Metal.—This useful alloy is composed as follows: Tin, 48 parts; lead, 32 parts; antimony, 10 parts; bismuth, 9 parts.

Cock Metal.—Copper, 20 lbs.; lead, 8 lbs.; litharge, 1 oz.; antimony, 3 oz.

Cooper's Pen Metal.—See Platinum and Copper alloys.

Copper Alloy.—The following alloy of copper will attach itself firmly to surfaces of metal, glass, or porcelain: 20 to 30 parts finely blended copper (made by reduction of oxide of copper with hydrogen or precipitation from solution of its sulphate with zinc) are made into a paste with oil of vitriol. To this add 70 parts mercury and triturate well; then wash out the acid with boiling water and allow the compound to cool. In ten or twelve hours, it becomes sufficiently hard to receive a brilliant polish and to scratch the surface of tin or gold. When heated it becomes plastic, but does not contract on cooling.

Blanched Copper.—Fuse 8 oz. of copper and ½ oz. of neutral arsenical salt, with a flux made of calcined borax, charcoal dust, and powdered glass.

Chinese White Copper.—Copper, 40 parts; nickel, 32 parts; zinc, 25 parts; iron, 3 parts.

Alloy for Cymbals and Gongs.—100 parts of copper with about 25 of tin. To give this compound the sonorous property in the highest degree, the piece should be ignited after it is cast, and then plunged immediately into cold water.

Delatot's Alloy.—Copper, 80 parts; manganese, 2 parts; 18 parts of zinc; and 1 part of calcium phosphate. It is rather difficult to prepare. Remove the scoria and add the zinc just before casting.

Delta Metal.—Alexander Dick has succeeded in producing a new copper-zinc alloy which exhibits characteristics essentially superior to ordinary brass. The advantages claimed for the new alloy, which has been named "delta metal," are great strength and toughness, and a capacity for being rolled, forged and drawn. It can be made as hard as mild steel, and when melted is very liquid, producing sound castings of close, fine grain. The color can be varied from that of yellow brass to rich gun metal; the surface takes a fine polish, and when exposed to the air, tarnishes less than brass. The latter characteristics will meet with ready appreciation for cabinet work, harness fitting, etc. The metal when cast in sand has a breaking strain of 21 to 22 tons per square inch; when rolled or forged hot into rods, the breaking strain is 43 tons per square inch; and when drawn into wire of 22 B. W. G., of 67 tons per square inch.

The following is an analysis of a specimen of delta metal: Copper, 55·90 per cent; lead, 0·70 per cent.; iron, 0·85 per cent.; manganese, 0·80 per cent.; zinc, 41·60 per cent.; nickel, a trace; phosphorus, 0·012 or 0·013.

Dental Alloys.—

	A.	B.	
Tin	91·63	36·78	parts.
Silver	3·82	48·32	"
Copper	4·4	.....	"
Gold		14·72	"
Mercury		....	"

Dental Plates, Alloy for. (Conway.) Bismuth, tin and lead are purified by separately melting and pour upon clean marble slabs, until all dross is removed, and afterward melting and pouring into lemon juice. The alloy is composed of platinum, gold, silver, bismuth, tin and lead.—*Science Record, 1875.*

Dysiot.—A bearing metal. It is composed of 60 or 62 parts of copper; 18 parts of lead; and 10 parts each of tin and zinc.

Electrum.—Nickel, 8 parts; copper, 16 parts; zinc, 7 parts.

English Metal.—88 tin, 2 pure copper, 2 brass (containing 75 copper, 25 zinc), 2 nickel, 1 bismuth, 8 antimony, 2 tungsten.

Fahlun Brilliants.—Tin, 60 parts; lead, 40 parts.

Fenton's Metal.—See Alloys.—White Metal.

Ferro-manganese is a variety of metal specially manufactured in a blast furnace from ores rich in oxide of manganese, and is very extensively used in the manufacture of mild steel. When the pig iron contains less than about 20 per cent. manganese, its fracture shows large crystalline cleavage planes and it is then termed spiegeleisen. The variety known as ferro-manganese is a hard crystalline body,

but the fractured surface does not present the large cleavage planes so characteristic of spiegeleisen. It contains from 20 to 85 per cent manganese.

Feuille Morte (dead leaf).—700 gold, 300 silver.

Fusible Metals.—Under the name fusible metal or fusible alloy is understood a mixture of metals which becomes liquid at temperatures at or below the boiling point of water. There are several such mixtures known, some of which *New Remedies* has gathered from one source and another, and placed in convenient order, as follows:

1. D'Arcet's: Bismuth, 8; lead, 5; tin, 3 parts. This melts below 212° F.

2. Walker's: Bismuth, 8; tin, 4; lead, 5 parts; antimony, 1 part. The metals should be repeatedly melted and poured into drops until they can be well mixed, previous to fusing them together.

3. Onion's: Lead, 3; tin, 2; bismuth, 5 parts. Melts at 197° F.

4. If to the latter, after removing it from the fire, one part of warm quicksilver be added, it will remain liquid at 170° F., and become a firm solid only at 140° F.

5. Another: Bismuth, 2; lead, 5; tin, 3 parts. Melts in boiling water.

Nos. 1, 2, 3, and 5 are used to make toy spoons to surprise children by their melting in hot liquors. A little mercury (as in 4) may be added to lower their melting points. Nos. 1 and 2 are specially adapted for making electrotype moulds. French cliche moulds are made with the alloy No. 2. These alloys are also used to form pencils for writing, also as *metal baths* in the laboratory, or for soft soldering joints. No. 4 is also used for anatomical injections.

Higher temperatures, for *metal baths* in laboratories, may be obtained by the following mixtures:

1 part tin and 2 parts lead melt at 441·5° F. 1 part tin and 1 part lead melt at 371·7° F. 2 parts tin and 1 part lead melt at 340° F. 63 parts tin and 37 parts lead melt at 344·7° F.

Fusible Alloys containing Cadmium.—Cadmium, like bismuth, has the valuable property of lowering the melting point of many alloys, some of which are readily fusible in boiling water. Cadmium does not render the alloys so crystalline and brittle as bismuth, many of its combinations being capable of being hammered and rolled. The chief use of cadmium is in fusible alloys, which are used as solders, for castings requiring a low temperature, and in dentistry for alloys for stopping hollow teeth. Alloys of cadmium generally contain tin, lead, bismuth, and cadmium. Mercury is sometimes added to still further lower the melting point. The following table shows the composition and melting points of the more important cadmium alloys:

	Cadmium.	Lead.	Tin.	Bismuth.	Melting point.
Lipowitz's alloy	3	8	4	15	158° F.
Fusible alloy...	2	11	3	16	170° "
" "	10	8	3	8	167° "
" "	1	..	2	3	203° "
" "	1	..	3	5	203° "
" "	1	..	1	2	202° "
" "	1	2	1	4	150° "
Wood's alloy...	2	4	2	5	160° "
Fusible alloy...	2	2	4	..	187° "
Type metal.....	22½	50	36	..	....

Table of Fusible Alloys.—

Bismuth.	Lead.	Tin.	Degrees F.	Bismuth.	Lead.	Tin.	Degrees F.
8	5	3	202	8	16	24	316
8	6	3	208	8	18	24	312
8	8	3	226	8	20	24	310
8	8	4	236	8	22	24	308
8	8	6	243	8	24	24	310
8	8	8	254	8	26	24	320
8	10	8	266	8	28	24	330
8	12	8	270	8	30	24	342
8	16	8	300	8	32	24	352
8	16	16	304	8	32	28	332
8	16	12	280	8	32	30	328
8	16	14	290	8	32	32	320
8	16	16	292	8	32	34	318
8	16	18	298	8	32	36	320
8	16	20	304	8	32	38	322
8	16	22	312	8	32	40	324

Fusible Metals for Use in Boilers, etc.—The following alloys, with their corresponding melting points, together with the temperature of steam at various pressures, may be used.

						Steam pressure by gauge.	Temp.
Tin 6	Lead 1				381° F.		
" 5	" 1				378° "		
" 4	" 1				365° "	120 lb.	350° F.
" 3	" 1				356° "	105 lb.	341° "
" 2	" 1				340° "	90 lb.	331° "
" 1½	" 1				334° "	75 lb.	320° "
" 4	" 4	Bismuth	1		320° "	60 lb.	307° "
" 3	" 3	"	1		310° "	45 lb.	282° "
" 2	" 2	"	1		292° "	30 lb.	274° "
" 1	" 1	"	1		254° "	15 lb.	250° "
" 2	" 2	"	1				292° "
" 3	" 3	"	1				310° "
" 4	" 4	"	1				320° "
" 6	" 1						381° "
" 5	" 1						378° "
" 4	" 1						365° "
" 3	" 1						356° "
" 2	" 1						340° "
" 1½	" 1						334° "
" 1	" 1						370° "
" 1	" 2						441° "
" 1	" 3						482° "
" 1	" 5						511° "
" 1	" 10						541° "
" 1	" 25						558° "

So much depends, however, on the way in which an alloy is made, the purity of its original metals, and the changing conditions to which a fusible plug is subjected, that it is very doubtful whether they should ever be depended upon in critical places.

Fusible Alloy, for silvering glass.—Tin, 6 oz.; lead, 10 oz.; bismuth, 21 oz.; mercury, a small quantity.

German Silver.—Albata, Argentan, Electrum, Nickel Silver, Tutenag, Virginian Plate, White Copper. A well known alloy, the finer varieties of which nearly equal silver in whiteness and susceptibility of receiving a high polish, while they surpass it in hardness and durability. The following formulæ are from the highest authorities:

1. Copper, 50 parts; nickel, 20 parts; zinc, 30 parts. Very malleable and takes a high polish.

2. Copper, 50 parts; nickel, 26 parts; zinc, 24 parts. Closely resembles silver; an excellent sample.

3. Copper and zinc, of each 41 parts; nickel, 18 parts. Rather brittle.

4. (M. Gersdorff.) Copper, 50 parts; nickel and zinc, of each, 25 parts. Very white and malleable, and takes a high polish. Recommended as a general substitute for silver.

5. (Gersdorff.) Copper, 60 parts; nickel and zinc, of each, 20 parts. For castings, as bells, candlesticks, etc.

6. (Gersdorff.) Copper, 60 parts; nickel, 25 parts; zinc, 20 parts. For rolling and wire. Very tough and malleable.

7. (Sample made from the ore of Hillburghausen.) Copper, 50⅛ parts; nickel, 31½ parts; iron, 2½ parts; zinc, 25½ parts. Equal to the best Chinese sample.

8. (Pelouze.) Copper and nickel, equal parts. Recommended by M. Pelouze as superior to any of the alloys containing zinc.

9. (Pelouze.) Copper, 2 parts; nickel, 1 part. Not so white as the last, but more malleable.

10. (White copper from China.) 1. Copper, 30 parts; nickel, 36 parts; zinc, 34 parts. 2. (Said to be prepared from native ore.) Copper, 41 parts; nickel, 32 parts; iron, 2½ parts; zinc, 24½ parts. Silvery white, takes a high polish, very sonorous, malleable both cold and at a dull red heat, and may be rolled into leaves or formed into wire.

11. (White metal spoon sold as German plate.) Copper, 55 parts; nickel, 24 parts; zinc, 16 parts; tin, 3 parts; iron, 2 parts.

The union of the metals in the above formulæ is effected by heat, with the usual precautions. When iron is ordered it is generally added under the form of "tin plate."

12. For fine German silver. Copper, 49 parts; zinc, 24 parts; nickel, 24 parts; aluminum, 2½ parts. All by weight. There are alloys of many other proportions that are recognized as standard.

13. First quality for casting. Copper, 50 lb.; zinc, 25 lb.; nickel, 25 lb.

14. Second quality for casting. Copper, 50 lb: zinc, 20 lb.; nickel (best pulverized), 10 lb.

15. For rolling.—Copper, 60 lb.; zinc, 20 lb.; nickel, 25 lb. Used for spoons, forks and table ware.

16. *Frick's German Silver.*—53·39 parts copper, 17·4 nickel, 13 zinc.

Gersnein's Alloy.—25 to 35 parts precipitated copper are ground with strong sulphuric acid in a porcelain mortar, and then 65 to 70 parts by weight of mercury are gradually added. When the copper is well amalgamated wash well in boiling water. When required for use make it soft and plastic by heating to 375° C. and grinding in a mortar until soft.

Gilding Metals.—4 copper, 1 brass (containing 3 copper, 1 zinc), and 70 tin for each 80 copper.

Glass Moulds, alloy for casting.—Iron, 100 parts; nickel, 15 parts.

Gold, Alloys and Preparations of.—Gold Dutch, Mannheim Gold, Mosaic Gold, Ormolu, Pinchbeck, Prince's Metal, Red Brass Similor, Tombac. These names are applied to several varieties of fine gold-colored brass, differing slightly in tint, and in the proportions of copper and zinc. At the celebrated works of Hegermühl, near Potsdam, the proportions, copper 11 parts to zinc 2 parts, are employed to produce a metal which is afterward rolled into sheets for the purpose of making Dutch leaf gold. This alloy has a very rich, deep gold color. Its malleability is so remarkable that it may be beaten out into leaves not exceeding $\frac{1}{375000}$ inch in thickness.

Gold, Weighing of.—Since the introduction of the decimal system, the method of expressing the fineness of gold alloys in thousandths has been gradually gaining ground. Its simplicity, over the old system of carats and grains, is its great recommendation. The carat consists of 4 carat-grains. The following table shows the equivalents of carat-grains and carats in thousandths:

1 grain	= 10·414	11 carats	= 458·630
2 "	20·828	12 "	500·000
3 "	31·242	13 "	541·667
4 "	41·660	14 "	583·333
1 carat	= 41·667	15 "	624·555
2 "	83·334	16 "	666·667
3 "	125 001	17 "	707·333
4 "	166·667	18 "	750·000
5 "	208·333	19 "	791·666
6 "	250·000	20 "	833·333
7 "	291·666	21 "	874·999
8 "	333·333	22 "	916·666
9 "	374·999	23 "	958·333
10 "	416·667	24 "	1000·000

Colored Golds.—Jewelers and goldsmiths use a variety of gold alloys for purposes of ornamentation, so as to produce a number of different shades of color in the same article. For example, red and white are employed for flowers, green for leaves, and yellow for stems, sprays, etc. The following table gives the composition per cent. of alloys most in use:

Color.	Gold.	Silver.	Copper.	Iron.	Platinum.	Cadmium.
White	.....	100	.....	.....	100	...
"	.....	.....	.....	.....	.....	....
Gray	85·7	8·6	.....	5·7	....	....
"	83·3	.....	.....	16 7	....	....
"	72·5	27·5	.....	.....	....	....
Green	75	25	.....	.....	....	....
"	75	16·6	.....	.....	..	8·4
"	74·6	11·4	9·7	.....	....	4·3
"	75	12·5	.....	.....	....	12·5
Pale yellow	91·67	8·33	....	.....	....	....
" "	91·67	.....	.....	8·33	....	....
Very pale	50	50	.....	.....	....	....
Yellow	100	.....	.....	.....	....	....
Deep yellow	90	.....	10	.....	....	....
" "	53	25	22	.....	....	....
Red	75	.....	25	.....	....	...
Dark red	50	.....	50	.	....	....
" "	25	.....	75	.....	....	....
Blue	75	.....	.....	25	....	....
"	66·7	.....	.....	33·3	....	....
Japanese blue gold	1 to 10	... ..	99 to 90	.....	...	....

Gold Alloy.—1. 800 parts of copper, 28 of platinum, and 20 of tungstic acid are melted in a crucible under a flux, and the melted mass poured out into alkaline water, so as to granulate it. It is then melted together with 170 parts of gold.

2. The alloy has about the color of 9 carat gold.

Silver	2·48
Platinum	32·02
Copper (by difference)	65·50
	100·00

Strong boiling nitric acid has apparently no action on it, even when left in the acid for some time.—*Chem. News.*

3. To make green gold, melt together 19 grs. pure gold and 5 grs. pure silver. The metal thus prepared has a beautiful green shade.

4. The following recipes for metals resembling gold are said to produce a metal which will so nearly approximate the genuine as to almost defy detection without a resort to thorough tests: Fuse, together with saltpeter, sal ammoniac, and powdered charcoal, 4 parts platinum, 2½ parts pure copper, 1 part pure zinc, 2 parts block tin, and 1½ parts pure lead. Another good receipt calls for 2 parts platinum, 1 part silver, and 3 parts copper.

5. The *Western Jeweler* gives the following formula:

Take 100 parts (by weight) of pure copper, 14 parts zinc or tin, 6 parts magnesia, 56 parts sal ammoniac, 18 parts quicklime, 9 parts cream of tartar. Melt the copper, and add gradually the magnesia, sal ammoniac, quicklime, and cream of tartar, each by itself, in the form of powder. Stir the whole for half an hour, add the zinc or tin in small pieces, and stir again till the whole is melted. Cover the crucible, and keep the mixture in a molten condition for thirty-five minutes. Remove the dross, and pour the metal into moulds. It has a fine grain, is malleable, and does not easily tarnish.

6. Pure copper, 100 parts; zinc, or preferably tin, 17 parts; magnesia, 6 parts; sal ammoniac, 3·6 parts; quicklime, 1·8 parts; cream of tartar, 9 parts. The copper is first melted, then the magnesia, sal ammoniac, lime, and tartar are then added, separately and by degrees, in the form of powder; the whole is now briskly stirred for about half an hour, so as to mix thoroughly; and then the zinc is added in small grains by throwing it on the surface and stirring till it is entirely fused; the crucible is then covered, and the fusion maintained for about thirty-five minutes. The surface is then skimmed and the alloy is ready for casting. It has a fine grain, is malleable, and takes a splendid polish. Does not corrode readily, and for many purposes is an excellent substitute for gold. When tarnished, its brilliancy can be restored by a little acidulated water.

Blue Gold.—750 gold, 250 iron; prepared by dipping iron wire into molten gold, then casting, hammering, and passing through a draw plate.

Alloy for Gold Chains.—1. Fine gold, 11 dwts. 6 grs.; fine silver, 2 dwts. 5 grs.; fine copper, 6 dwts. 13 grs.

2. Fine gold 1 oz.; fine silver, 9 dwts.; fine copper, 8 dwts.

Alloys, Enameling Gold.—1. Fine gold, 1 oz.; fine silver, 1 dwt. 12 grs.; fine copper, 2 dwts. 12 grs.

2. Fine gold, 1 oz.; fine silver, 9 dwts. 12 grs.; fine copper, 7 dwts. 12 grs.

Gold, Factitious.—Copper, 16 parts; platinum, 7 parts; zinc, 1 part, fused together. This alloy resembles in color gold of 16 carats fine, or two-thirds, and will resist the action of nitric acid, unless very concentrated and boiling.

Fine Gold.—750 gold, 250 silver.

Gold, Grain, Cupelled.—Gold, 1 part; silver, 3 parts; melted together, and poured in a small stream into water, the silver being afterward dissolved out by digestion in boiling nitric acid, and the grains, after being well washed in water, heated to redness in a crucible or cupel. Used to make preparations of gold.

Jewelry Gold.—88·85 gold, 5·7 silver, 10·20 copper.

Gold, Jewelers'.—This term is applied to alloys of gold used for trinkets and inferior articles of jewelry, ranging from 3 or 4 carats fine upward. The lowest alloy of this class is formed of copper, 16 parts; silver, 1 to 1½ parts; gold, 2 to 3 parts, melted together.

Mannheim Gold, Similor, Prince's Metal.—The composition of this alloy varies considerably, as will be seen from the following analyses of three samples:

Copper...	83·1	88·9	75
Zinc.....	10·0	10·3	25
Tin...	6·9	0·8	..

The first has a yellowish red tint and the second one a deeper red. Similor has been much used for buttons and other stamped work requiring a reddish cast of color.

Mock Gold.—1. 16 copper, 7 platinum, 1 zinc.

2. 100 copper, 17 tin, 6 magnesia, 3·6 sal ammoniac, 1·8 quicklime, 9 bitartrate of potash. The copper is melted first, and the magnesia, ammonia, lime, and potash are successively added in small quantities; finally the tin is introduced in fragments, and the whole fused for thirty-five minutes.

Nurnberg Gold.—Copper, 90 per cent.; gold, 2·5 per cent.; aluminum, 7·5 per cent.

Red Gold.—750 gold, 250 copper.

Ring Gold.—49·6 coin gold, 12·3 silver, 23·6 refined copper.

White Gold, Electrum.—Gold whitened by addition of silver.

Yellow Gold, Antique.—Pure gold.

Yellow Dipping.—2 bronze (containing 7 copper, 2 tin, 3 zinc), 1 copper, and 10 tin for each 640 copper.

Gun Metal.

	Copper.	Tin.	Iron.	Zinc.	Lead.
English ordnance	91·74	8·26	....	....	.....
" "	91·80	8·20	....	....	.....
Eight-pounder guns...	91·66	8·33	....	....	.....
Prussian ordnance.....	90·91	9·09	....	....	.....
French "	90·73	9·27	....	....	.....
" "	90·09	9·90	....	....	.....
American compressed ordnance.....	90·00	10·00	....	....	.....
American compressed ordnance.....	90·27	9·73	....	....	.....
Russian ordnance (1819)	88·61	10·70	0·69	....	.....
Swiss "	88·93	10·38	0·11	0·42	0·06
Chinese "	77·18	3·42	1·16	5·02	13·22
" "	93·19	5·43	1·38	....	.. ..

Heterogeneous Metal for Music Printing Plates, etc.—(Jean.) Tin, 10 parts; zinc, 12 parts; antimony regulus, 3 parts; copper, 1 part; lead, 74 parts.

Homberg's Alloy.—Bismuth, lead and tin, equal parts.

Alloy for Horology.—The following alloy, suited for the sockets of pivots of watches, was invented by Mr. Bennett. It consists of—gold, 31 parts; silver, 19; copper, 39; and palladium, 11. He states that this alloy melts at a lower temperature than gold, and is harder than hammered iron. It has a reddish-brown color, is as fine-grained as steel, and works as easily as brass, but its friction is much slighter than on ordinary pivots. Its most valuable property is that the oil it absorbs is not decomposed, but remains pure in a fluid state. It has still greater advantages over sockets of fine stone, as it is not apt to break, is susceptible of a high polish, and is less costly than hard stone.

Metal for taking Impressions. 1. Lead, 3 lb.; tin, 2 lb.; bismuth, 5 lb.

2. Lead, 4½ lb.; bismuth, 7½ lb.; tin, 3 lb.

Hoyle's White Alloy. See *White Metal.*

Jacoby's Alloy. See *White Metal.*

Jewelers' Alloys. See the following under alloys. *Algiers Metal, Ashberry Metal, Chrysocale, Dipping Metal, English Metal, Feuille Morte, Mock Gold, Minofor, Plate Pewter, Queen's Metal, Tubania, Vert d'Eau, Yellow Dipping,* and the following:

Common Jewelry.—1. 3 refined copper, 1 old Bristol bronze, and 25 tin for every 100 copper, the tin being replaced by a compound of lead and antimony when a fine polish is needed.

2. The following forms a fusible malleable metal, easily worked by a silversmith, resisting oxidation, and capable of being soldered: 720 parts copper, 125 nickel, 10 bismuth, 90 zinc, 20 soft iron, 20 tin.

3. Sauvage has introduced the following alloy: 58 copper, 27 zinc, 12 nickel, 2 tin, 0·5 alumina, 0·5 bismuth; the ingredients are fused separately, mixed, and the whole is run down into a homogeneous mass, which is silvery, sonorous, malleable, ductile, tenacious, polishes well and does not tarnish.

4. As a silvery-looking alloy, Parker recommends 70 copper, 30 manganese, 20 to 35 zinc, or

if not needing to be subjected to high temperature, 49 copper, 21 manganese, 5 to 10 iron, 5 to 10 zinc. The solder used for it contains 7 copper, 3 manganese, 1 to 2 silver.

5. Cheap 4 carat gold. Copper, 9 parts; gold, 2 parts; silver, 1 part.

Journal Boxes, Alloy for.—Copper, 24 lb.; tin, 24 lb.; and antimony, 8 lb. Melt the copper first, then add the tin, and lastly the antimony. It should be first run into ingots, then melted and cast in the form required for the boxes.

Kingston's Metal.—See *White Metal.*

Krafft's Alloy.—Bismuth, 50 parts; lead, 20 parts; tin, 10 parts.

Kustitien's Metal.—Take of malleable iron, 3 parts; beat it to whiteness, and add antimony, 1 part; Molucca tin, 72 parts; mix under charcoal, and cool. Used to coat iron and other metals with a surface of tin; it polishes without a blue tint, is hard, and has the advantage of being free from arsenic.

Leading, Hot Alloys for.—Tin, 3 parts; lead, 17 parts.

Lechesne.—Copper, 1,200 parts; nickel, 800 parts; aluminum, 1 part. Melt the nickel first.

Lemarquand's Alloy.—This remarkable alloy is said to be non-oxidizable if all of the metals used are strictly pure. It is composed of 150 parts of copper; 28 parts of nickel; 4 parts of tin in sticks; 4 parts of black oxide of cobalt; and 14 to 15 parts of zinc.

Lining Metal, for boxes of railroad cars.—Mix tin, 24 lb.; copper, 4 lb.; antimony, 8 lb. (for a hardening); then add tin, 72 lb.

Lutecine or Paris Metal.—MM. Le Mat, Picard, and Bloch give the following proportions for this alloy: Copper, 800; nickel, 160; tin, 20; cobalt, 10; iron, 5; zinc, 5. Total, 1,000.

Macht's Yellow Metal is composed of 57 parts copper and 43 parts zinc. It has a reddish-yellow color, malleable when rolled hot, but not in the cold. It is said to be suitable for fine castings, as it possesses great strength.

Maillechort.—Copper, 60 per cent.; zinc, 20 per cent.; nickel, 20 per cent.; Jemmapes brass—copper, 64·5.

Manganese Alloys.—Cupro-manganese, 6 parts; lead, 9 parts; tin, 48 parts; zinc, 9 parts. Tin, 32 parts; zinc, 7 parts; lead, 7 parts; cupro-manganese, 2 parts.

Manganese Steel.—Copper, 80 per cent.; manganese, 15 per cent.; zinc, 5 per cent.

Marley's Alloy.—This alloy is also said to be non-oxidizable like Lemarquand's alloy (which see) if the materials are pure. Nickel, 7 parts; iron and zinc, 2 parts each; 5 parts of brass, and 4 parts of tin. After casting the articles they must be heated to a white heat and dipped in a mixture of acids prepared as follows: Mix 12 parts of sulphuric acid, 2 parts of nitric acid, and 1 part of hydrochloric acid, and the whole diluted with 5 parts of water. Great care should be used in mixing the acids. They should be added very gradually.

Martial Regulus.—35 parts of antimony and 5 parts of iron.

Metal for Medals.—50 parts copper, 4 zinc.

Minargent.—Copper 56, nickel 40, tungsten 3, aluminum 1 per cent.

Minofor.—3·25 copper, 67·50 tin, 17 antimony, 8·95 zinc.

Chinese Mirrors.—Copper, 62 parts; tin, 32 parts; lead, 6 parts.

Mirrors.—Alloy of gold and platinum for coating. A solution of 500 grammes of spongy platinum in 100 c. c. of a mixture of equal parts of hydrochloric and nitric acids is evaporated to dryness, and the dry residue after powdering digested with 2,000 grammes of lavender essence, 100 grammes of turpentine, and 25 grammes of sulphureted turpentine resins. The gold, 30 grammes, is transformed into chloride and this is dissolved in a 1,000 c. c. of a mixture of equal parts of ether and water. The mixture is well shaken, and ethereal solution added to the platinum and left to evaporate spontaneously. The mixture receives afterward a charge of 50 grammes of litharge, and a like quantity of lead borate, and 100 grammes of lavender oil are added to it, when it will be ready for coating the mirror, which has to be exposed to red heat until the composition is burnt in.—*Dingler's Polytechnisches Journal.*

Models, Alloy for Making.—A good alloy for making working models is 4 parts copper, 1 part tin, and ¼ part zinc. This is easily wrought. Doubling the proportion of zinc increases the hardness.

Parker's Mosaic Gold.—Copper, 100 parts; zinc, 54 parts; mix. For common jewelry—Copper, 3 parts; 1 part old brass, and 4 oz. tin to every pound of copper.

Mousset's Silver Alloy.—Copper, 59 parts; silver, 27 to 28 parts; zinc, 9·5; nickel, 3·5 parts.

Muntz Metal.—6 parts copper; 4 parts zinc. Can be rolled and worked at a red heat.

Composition Tacks for Muntz Metal on Ships.—Zinc, 2 parts; tin, 4½ parts; copper, 43½ parts.

Neogen.—Copper, 58 parts; zinc, 27 parts; tin, 2 parts; nickel, 12 parts; bismuth, ½ part; aluminum, ½ part.

Niello.—This consists of nine parts silver, one part copper, one part lead, and one part bismuth, which are melted together, and saturated with sulphur. This mixture produces the gorgeous blue which has often been erroneously spoken of as steel blue.

Non-Magnetic Alloy.—This is used in some of the Swiss watches to take the place of steel in the hair springs. It is composed of equal parts of gold and palladium, copper about 15% of the whole, and a trace of rhodium and manganese are added; this may vary from 1-10th of 1% to 5% of each. The copper and manganese are first added.

Another alloy which is used to some extent is composed of tin, copper, iron, lead, zinc, nickel and manganese. The proportions vary, but 60% of copper, 20 of nickel and 18 of zinc, with the other ingredients, 1% or less.

Alloys said to be Non-oxidizable.—Lemarquand's alloy is said to consist of: copper 75, nickel 14, cobalt 15, tin 18, and zinc 72 parts. The metals must be pure. Marlie's alloy consists of: iron 10, nickel 35, brass 25, tin 20, zinc 10. Articles prepared from this alloy are made white hot, and dipped into a mixture of sulphuric acid 60 parts, nitric acid 10, hydrochloric acid 5, and water 25.

An alloy used as a substitute for gold and said to be non-oxidizable was found by the author to contain: copper 94·8, zinc 2·8, lead 0·67 and iron 1·34 per cent. The inventor recommends to dip the articles in dilute nitric acid, then to swill and dry, then to polish; and claims that they will keep their color for a long time.

A new alloy has been prepared by Herr Reith of Bockenheim, Germany, and is said to practically resist the attack of most acid and alkaline solutions. It consists of: copper 74·5, tin 11·6, lead 9, antimony 4·9 parts. This alloy is therefore a bronze with the addition of lead and antimony. The inventor claims that it can be very advantageously used in the laboratory to replace vessels or fittings of ebonite, vulcanite, or porcelain.

Ormolu.—The ormolu of the brass founder, popularly known as an imitation of red gold, is extensively used by the French workmen in metals. It is generally found in combination with grate and stove work. It is composed of a greater portion of copper and less zinc than ordinary brass, is cleaned readily by means of acid, and is burnished with facility. To give this material the rich appearance, it is not unfrequently brightened up after "dipping," by means of a scratch brush, the action of which helps to produce a very brilliant gold-like surface. It is protected from tarnish by the application of lacquer.

Oroide.—The alloy popularly known as oroide, from which a large number of cheap

watches, chains, and trinkets are now manufactured, is made of pure copper 100 parts, tin 17 parts, magnesia 16 parts, sal ammoniac ½ part, quicklime ⅛ part, tartar of commerce 9 parts. The copper is first melted, then the magnesia, sal ammoniac, lime and tartar in powder are added little by little and briskly stirred for half an hour. The tin is lastly mixed in grains until all is fused. The crucible is covered, and the fusion maintained for 35 minutes, when the dross is skimmed off and the alloy is ready for use.

Packfong.—1. Copper, 40 parts; zinc, 25 parts; nickel, 31 parts.

2. Copper, 43 parts; zinc, 40 parts; nickel, 16 parts.

3. Copper, 45 parts; zinc, 21 parts; nickel, 33 parts.

Palladium and Silver Alloys.—Silver, 1 part; palladium, 8 to 10 parts. Used by dentists.

Parisian Alloy.—Copper, 69 parts; nickel, 19·5 parts; zinc, 6·5 parts; cadmium, 5 parts.

Patterns, Mixture for.—The best mixture for small patterns, that does not shrink in casting, is: 69 parts lead, 15½ parts antimony, 15½ parts bismuth by weight. A cheap kind for finished patterns can be made of 10 parts zinc, 1 part antimony, 1 part tin.

Alloy for Best Pens.—Fine gold, 1 oz.; fine silver, 5 dwts.; fine copper, 7 dwts. 18 grs.; spelter, 1 dwt. 6 grs.

Pewter.—1. Prep. (Aiken.) Tin, 100 parts; antimony, 8 parts; copper, 4 parts; bismuth, 1 part; fuse together. Very fine.

2. Plate pewter. Tin, 100 parts; antimony, 8 parts; bismuth and copper, of each, 2 parts. Very fine. Used to make plates, etc.

3. Trifle. Tin, 83 parts; antimony, 17 parts. Some lead is generally added.

4. Ley. Tin, 4 parts; lead, 1 part. Used for beer pots, etc.

Best Pewter.—5 lb. tin to 1 lb. of lead.

Common Pewter.—82 parts pure tin, 18 parts lead.

Plate Pewter.—90 tin, 7 antimony, 2 bismuth, 2 copper.

Pinchbeck.—Copper, 5 lb.; zinc, 1 lb.

Pipe Metal for Organs.—Melt equal parts of tin and lead. This alloy is cast, instead of rolled, in the desired form of sheets, in order to obtain a crystallized metal, which produces a finer tone. The sheets are formed by casting the metal on a horizontal table, the thickness being regulated by the height of a rib or bridge at one end, over which the superfluous metal flows off. The sheets thus obtained are planed with a carpenter's plane, bent up, and soldered.

Pirsch Baudoin's Alloy.—This alloy is complicated, and is rather difficult of preparation. It is composed of 70 per cent. of copper and nickel, cobalt, tin, zinc, and aluminum in various proportions.

Platinum Bronze.—Several alloys of platinum, of a comparatively inexpensive nature, have been manufactured under the above name, and it has been claimed for them that they are indifferent to the action of air and water. They admit of a high polish, and retain their luster for a long time. The following table shows their composition and uses:

Uses.	Parts.				
	Nickel.	Platinum.	Tin.	Silver.	Brass.
For table utensils	90·0	0·9	9·0	....	....
" bells	81·5	3·8	16·0	1·7	....
" articles of luxury	86·5	0·5	13·0	....	....
" tubes for telescopes, etc.	71·0	14·5	14·5	....	....
" ornaments	31·6	3·2	....	....	65·2

Platinum and Copper Alloy.—An alloy of 1 part platinum and 4 parts copperas, hard, ductile, of a yellow-pink color, and susceptible of a high polish.

An alloy of equal parts by weight of copper and platinum, according to Clarke, is yellow, having the color and specific gravity of gold, extensible, easily worked by the file, and tarnished by exposure to air.

An alloy of 4 parts platinum and 96 parts copper is malleable, rose-colored, and exhibits a fine-grained fracture.

An alloy of 3 parts platinum and 2 parts copper is nearly white, very hard, and brittle.

The following alloys have a golden yellow color. No. IV., known as Cooper's gold, is malleable, ductile, and closely resembles 18 carat gold:

	I.	II.	III.	IV.	V.	VI.	VII.	VIII.
Platinum	18·2	5	29·3	18·75	57·7	66·7	29·1	19·0
Copper	45·5	....	66·7	81·25	38·5	29·1	66·7	81·0
Zinc	....	....	4·0	.....	3·8	4·2	4·2	.....
Silver	9·0	5	....	.....	....	....	....	.....
Brass	18·2	60	....	.....	....	....	.....	.....
Nickel	9·0	30	..	.....	....	....	. .	.....

Cooper's Mirror Metal.—Copper, 57·85; platinum, 9·49; zinc, 3·51; tin, 27·49; arsenic, 1·66. The inventor claims for this alloy that it is indifferent to the weather, and takes a beautiful polish.

Cooper's Pen Metal.—The above alloy is said to be suitable for pens. Another alloy consists of copper, 13 parts; platinum, 50 parts; and silver, 36 parts. The hardness and non-corrosive character of Cooper's alloys render them suitable for the manufacture of mathematical instruments and for chronometer wheels.

Platinum and Nickel.—According to Lampadius, equal parts of nickel and platinum unite to form a pale yellowish white alloy, perfectly malleable, susceptible of a high polish, equal to copper in fusibility and to nickel in magnetic power.

Platinor.—This is a name given to certain alloys containing platinum of a golden yellow color, and consisting of platinum, copper, silver, zinc, and nickel. An alloy of the color of gold, and said to be quite constant in air, is prepared as follows: Melt 10 parts of silver with 45 parts of copper, then add 18 parts of brass and 9 parts of nickel. The temperature must then be raised to the highest pitch, and 18 parts of platinum black added.

Birmingham Platinum and Platinum Lead are used for certain castings, but the composition is variable, according to the taste of the manufacturer. The following will illustrate this point:

Copper	46·5	43	20
Zinc	53·5	57	80

Pot Metal.—This is an alloy of copper and lead, in the proportion of 8 parts of copper to 3 of lead. The lead is an impurity in the zinc used for making the brass. Pot metal is very brittle when warmed; it is chiefly used for making large vessels.

Lead.	Copper.	Description.
oz.	lb.	
2	1	Red ductile alloy.
4	1	do.
6	1	Dry pot metal or cock alloy.
7	1	do. but shorter.
8	1	Wet pot metal.

Potin.—Copper, 71·9; zinc, 24·9%; tin, 1·2%; lead, 2.

Prince's Metal.—A name given to various yellow alloys varying from 60 to 75% of copper and 40 to 25% zinc.

Queen's Metal.—A very fine silver-looking metal is composed of 100 lb. of tin, 8 lb. of regulus of antimony, 1 lb. of bismuth, and 4 lb. of copper.

Reflector Metal, Duppler's.—1. Silver, 80 parts; zinc, 20 parts.

2. Copper, 66·22 parts; tin, 33·11 parts; arsenic, 0·67 part.

Rivet Metal.—Copper, 32 oz.; tin, 2 oz.; zinc, 1 oz.

Rivet Metal, for Hose.—Copper, 64 lb.; tin, 1 lb.

Rose's Alloy.—Bismuth, lead and tin, equal parts. Melts at 93° C.

Shakdo.—This is a famous Japanese alloy. It is composed of copper and gold, the proportions of the latter being variable, being from 2 to 8%.

Patent Sheathing for Ships.—(Baron Wetterstedt.) This consists of lead with from 2 to 8 per cent. of antimony. Usually about 3 per cent. is used.

Shot Metal.—1. Lead, 1,000 parts; arsenic, 3 parts.

2. Lead, 97 parts; arsenic, 3 parts.

Sideraphite.—Iron, 63 parts; 23 parts nickel; 4 parts of tungsten; 5 parts of aluminum; and 5 parts of copper.

Silicon-copper and Silicon-bronze are made, according to Weiller, the inventor of these combinations, in the following manner. He recommends the following proportions: potassium silico-fluoride, 450 parts by weight; powdered glass, 600 parts; common salt, 250 parts; carbonate of soda, 75 parts; carbonate of lime, 60 parts; and dried chloride of calcium, 500 parts. The mixture is heated in a covered plumbago crucible to a temperature a little below the point when they begin to act on each other, when the mixture is added to the molten copper or bronze, as the case may be; the reduced silicon combining with the metal or alloy.

Silver Alloys. See also the following: *Clark's Alloy, Baudoin's Alloy, Chinese Silver, Parisian Alloy, Minargent, Warne's Alloy, White Alloy.*

Silver Alloys.—Table of silver alloys:

	Name.	Silver.	Copper.	Nickel.	Spelter (Zinc.)
		oz. dwt. gr.	oz. dwt. gr.	oz. dwt. gr.	oz. dwt. gr.
0	Filigree silver.	Pure	0 0 0	0 0 0	0 0 0
1	Standard, Hall..	0 19 6	0 0 18	0 0 0	0 0 0
2	Standard, coin.	0 18 12	0 1 12	0 0 0	0 0 0
3	Silver alloy.....	0 18 0	0 2 0	0 0 0	0 0 0
4	"	0 16 0	0 4 0	0 0 0	0 0 0
5	"	0 15 0	0 5 0	0 0 0	0 1 0
6	"	0 14 0	0 6 0	0 0 0	0 0 0
7	"	0 13 12	0 6 12	0 0 0	0 0 0
8	" ...	0 13 0	0 7 0	0 0 0	0 0 0
9	"	0 12 12	0 7 12	0 0 0	0 0 0
10	"	0 12 0	0 8 0	0 0 0	0 0 0
11	Common silver.	1 0 0	0 17 0	0 13 0	0 0 0
12	"	1 0 0	0 16 0	0 10 12	0 3 12
13	"	1 0 0	1 2 0	0 15 0	0 0 0

1. Sterling silver. Fine silver, 5 oz., 11 dwt.; fine copper, 9 dwt.

2. Equal to Sterling-fine silver, 1 oz.; fine copper, 1 dwt. 12 gr.

3. 65 parts of iron and 4 parts of tungsten are melted together and granulated; also 23 parts nickel, 5 of aluminum, and 5 of copper, in a separate crucible, to which is added a piece of sodium, in order to prevent oxidation. The two granulated alloys are then melted together. Both alloys resist the action of sulphureted hydrogen.

4. Copper, 71 oz.; zinc, 7 oz.; nickel, 16½ oz.; iron, 1¼ oz.; cobalt (oxide), 1¾ oz.; tin, 2½ oz. First fuse the zinc with 12 parts of the copper; then fuse the nickel with its own weight of the zinc alloy in a good blacklead crucible, and the iron, the remainder of the copper, and the oxide of cobalt mixed with charcoal. Cover the mass with charcoal, lute, and expose to a high heat. When properly fused, allow the heat to subside and add the remainder of the copper-zinc alloy when the temperature is just sufficient to fuse it. Remove the crucible from the fire and stir its contents well with a hazel stick. Wrap the tin in several thicknesses of dry paper, drop it into the alloy, stir for a moment, and run into the moulds. When cold, it is ready to be wrought like silver, which it resembles in every respect. The zinc is nearly all volatilized during the process of fusion.

Chinese Silver.—1. Copper, 58 parts; zinc, 17·5 parts; nickel, 11·5 parts; cobalt, 11 parts; silver, 2 parts.

2. 55·2 parts copper, 19·5 zinc, 13 nickel, 2·5 silver, and 12 cobalt of iron.

Imitation of Silver.—Tin, 3 oz.; copper, 4 lb.

Solder Alloys.—Table of, and the heat at which they melt.

Tin.	Lead.	Melts at
1 part.	25 parts.	558° Fahr.
1 "	10 "	541 "
1 "	5 "	511 "
1 "	3 "	482 "
1 "	2 "	441 "
1 "	1 part.	370 "
3 parts.	2 parts.	334 "
2 "	1 part.	340 "
3 "	1 "	356 "
4 "	1 "	365 "
5 "	1 "	378 "
6 "	1 "	381 "

Sorel's Alloy.—

Copper	1	10
Zinc	98	80
Iron	1	10

Iron is used in the form of turnings, and melted with the copper and zinc under a layer of charcoal. But as zinc so readily volatilizes, it is advisable to employ zinc already containing iron, by which a more uniform alloy is obtained, with the minimum loss of zinc.

Speculum Metal.—Equal parts of tin and copper form a white metal as hard as steel. Less tin and a small quantity of arsenic added to the alloy forms a white, hard metal of high luster. 2 lb. copper, 1 lb. tin, and 1 oz. arsenic form a good speculum metal. An alloy of 32 copper, 16·5 tin, 4 brass, 1·25 arsenic is hard, white, and of brilliant luster.

Specular Alloys.—These are employed for making metallic reflectors, requiring a true white color, good luster, and a hard, clean surface, not easily tarnished or scratched. Fesquet gives a number of combinations, as follows: 1. 62 parts copper, 32 parts tin, 6 parts lead. 2. 80 parts copper, 10 parts lead, 10 parts antimony. 3. 66 to 63 parts copper, 33 to 27 parts tin. 4. 10 parts copper, 10 parts tin, 10 parts antimony, 50 parts lead. 5. 32 parts copper, 50 parts tin, 1 part silver, 1 part arsenic. 6. 90 parts steel, 10 parts nickel. 7. 50 parts palladium, 50 parts silver. 8. 60 parts platinum, 40 parts copper. 9. 50 parts platinum, 50 parts steel. 10. 50 parts platinum, 50 parts iron. 11. 10 parts platinum, 90 parts steel. 12. 20 parts platinum, 80 parts copper, 0 5 to 1 part arsenic. 13. 60 parts platinum, 30 parts iron, 10 parts gold. 14. 50 parts gold, 50 parts zinc. 15. 50 parts steel, 50 parts rhodium. 16. 10 parts platinum, 90 parts iridium. 17. 29 parts tin, 19 parts lead. 18. 52 parts copper, 30 parts nickel, 12 parts zinc, 5 parts lead, 1 part bismuth.

Good speculum metal should be pure white, of a fine grained structure, perfectly sound and homogeneous when cast, and sufficiently tenacious to stand grinding and polishing without rupture. It should contain 65 to 68 per cent. of copper to comply with these requisites. The following table exhibits different varieties:

	Copper.	Tin.	Zinc.	Arsenic.	Lead.	Other metals.
English alloy	66·6	33·4	....	....	..	....
Ross's alloy	68·21	31·79	....	....	..	....
Ancient mirror	62	32	....	..	6	....
Richardson's alloy	65·3	30	0·7	2	..	2 silver.
Sallit's alloy	64·6	31·3	....	....	..	4·1 nickel.
Chinese alloy	80·83	11·67	....	....	..	8·5 antimony.

Table of Speculum Alloys.

Silver.	Brass.	Copper.	Tin.	Arsenic.
....	....	32	14	2
....	....	32	13½	1½
....	....	6	2	1
....	....	32	2	1
....	....	3	1¼	....
....	....	64	29	....
1	1	32	15	....

In using arsenic, it must be introduced into the crucible when the mixture is in a melting state. Being in a coarsely pounded state, it is tied up in a paper bag and let into the crucible by a pair of tongs. The whole mixture requires to be stirred with a birch rod till vapors cease to rise. Avoid breathing or inhaling while the vapors appear; as soon as they are over, the alloy is ready for pouring. Arsenic renders alloys white and hard.

The alloys containing arsenic should be taken out of the flask as soon as properly set, and placed in hot ashes, and in a proper place for protracted annealing.

Spence's Metal.—This important alloy was discovered by Mr. Spence of England. It is prepared by melting together the three sulphides of zinc, iron and lead with sulphur. It is proof against the atmosphere and resists acids and alkalies.

Statuary Metal.—91·4 parts copper, 5·53 zinc, 1·7 tin, 1·37 lead; or copper 80, tin 20.

Stereotype Metal.—1 tin; 1 antimony; 4 lead. In using stereotype metal, brush the type with plumbago or a small quantity of oil, then place in a frame and take a cast with plaster of Paris. The cast is dried in a very hot oven, placed face downward upon a flat plate of iron; this plate is laid in a tray or pan of iron, having a lid securely fastened, and furnished with a hole at each corner. Dip the tray in the fluid metal, which will flow in at the four corners. When the tray is removed, dip the bottom only in water; and as the metal contracts in cooling, pour in melted metal at the corners, so as to keep up the fluid pressure, and obtain a good solid cast. When cool, open the tray; remove the cake of plaster and metal, and beat the edges with a mallet to remove superfluous metal. Plane the edges square, turn the back flat, in a lathe, to the required thickness, and remove any defects. If any letters are damaged, cut them out, and solder in separate types instead. Finally, fix upon hard wood to the required height.

Stopcocks, Alloy for.—Zinc, 72 parts; tin, 21 parts; copper, 7 parts.

Tiers Argent.—Silver, 33⅓; aluminum, 66⅔.

Metal for Tinning.—Malleable iron, 1 lb., heat to whiteness; add 5 oz. regulus of antimony and Molucca tin 24 lb.

Tissier's Metal.—Copper, 97 per cent.; zinc, 2 per cent.

Tombac.—1. An alloy consisting of copper, 16 lb.; tin, 1 lb.; zinc, 1 lb. Red tombac is composed of: copper, 10 lb.; zinc, 1 lb.

2. Copper, 16 lb.; tin, 1 lb.; zinc, 1 lb.

Red Tombac.—Copper, 10 lb.; zinc, 1 lb.

Tournay's Metal.—Copper, 82·5%; zinc, 17·5%.

Tubania, Engestrum.—4 copper, 8 antimony, 1 bismuth, added to 100 tin.

Tubania, English.—12 brass (containing 7 copper, 3 zinc), 12 tin, 12 bismuth, 12 antimony.

Tubania, German.—0·4 copper, 3·2 tin, 42 antimony.

Tubania, Spanish.—24 iron and steel scraps, 48 antimony, 9 niter. The iron and steel are heated to whiteness, and the antimony and niter gradually added; 2 oz. of this is alloyed with 1 lb. tin; a little arsenic is an improvement.

Spanish Tutania.—Iron or steel, 8 oz.; antimony, 16 oz.; niter, 3 oz. Melt and harden 8 oz. tin with 1 oz. of this compound.

Another Tutania.—Antimony, 4 oz; arsenic, 1 oz.; tin, 2 lb.

Tutenag.—Copper, 8 parts; nickel, 3 parts; zinc, 5 parts.

The manufacture of type from the alloy by stamping or pressing is only adopted in certain cases, the types being generally cast. The alloys, being well adapted for castings, are employed for certain kinds of ornamental work.

An alloy for keys of flutes and similar parts of musical instruments consists of lead 2 parts and antimony 1 part.

Type Metal.—9 parts lead to 1 antimony forms common type metal; 7 lead to 1 antimony is used for large and soft type; 6 lead and 1 antimony for large type; 5 lead and 1 antimony for middle type; 4 lead and 1 antimony for small type; and 3 lead to 1 antimony for the smallest kinds of type.

Erhardt's Type Metal.—Zinc, 93 per cent.; lead

Type Metal, Alloys used for.

	Lead.	Antimony.	Tin.	Bismuth.	Copper	Zinc.	Other metals.
Printing types	4·0	1·0	.....	.....	.....	.....	.....
" "	7·5	2·5	.....	.....	0·5	.....	.....
" "	9·0	1·0	.....	.....	.....	.....	Arsenic 0·5
" "	64·0	8·0	12·0	.....	.....	16·0	.....
Small types and stereotypes	9·0	2·0	.....	2·0	.....	.....	.....
" " " "	16·0	4·0	5·0	.....	.....	.....	.....
" " " "	3·0	1·0	.....	.....	.....	.....	.....
" " " "	5·0	1·0	.....	.....	.....	.....	.....
" " " "	10·0	2 0	.....	1·0	.....	.....	.....
Plates for engraving music, etc	.....	5·0	5·0	.....	.....	.....	.....
" " " " "	.....	2·5	7·5	.....	.....	.....	.....
" " " " "	64·0	8·0	12·0	.....	.....	16·0	.....
" " " " "	60·0	2·5	37·5	.....	.....	.....	.....

3 per cent.; tin, 3 per cent.; copper, 2 per cent.

Uchatius Bronze.—The composition of this famous ordnance bronze is a secret, owned by the Austrian government.

Unalterable Alloy (Jacobi).—Copper, 70 to 73 per cent.; tin, 2 to 11 per cent.; lead, 15 to 20 per cent.; zinc, 0·5 to 1 per cent. This alloy possesses a yellowish red tint, and may be used for objects of art, imitation jewelry, etc. When treated with sulphides, chloride of antimony, chloride of arsenic, etc., this alloy becomes coated with a black patina, capable of being polished.

Vaucher's Alloy.—See *White Metal.*

Vert d'Eau, Water Green.—600 gold, 400 silver.

No. 1 is used for lining crosshead slides, rod brasses, and axle bearings. No. 2 is used for lining axle bearings and connecting rod brasses of heavy engines. No. 3 is used for lining eccentric straps and for bronze slide valves. No. 4 is a special alloy for metallic rod packing.

White Alloy.—1. Copper, 64·5 parts; tin, 32 parts; arsenic, 3·5 parts.

2. Copper, 59; tin, 31; brass, 8; arsenic, 2 per cent.

3. Tin, 82; lead, 18; antimony, 5; zinc, 1; and copper, 4 parts.

White Alloys for Bearings.

	Tin.	Copper	Antimony.	Lead.	Zinc.	Iron.
Kingston's metal with 6 per cent. of mercury added	88·0	6·0				
Fenton's metal for axle boxes of locomotives and wagons	14·5	5·5			80·0	
Stephenson's alloy	31·0	19 0			19·0	31·0
For propeller boxes	14·0	57 0			29·0	
Dew Pance's metal for locomotives	33·3	22·2	44·4			
Hoyle's alloy for pivot bearings	46·0		12·0	42·0		
Jacoby's alloy	85·0	5·0	10·0			
For propeller bush	26·0	5·0			69·0	
Very hard bearing	12·0	4·0	82·0		2·0	
Anti-friction metal	14·0	6·0			80·0	
For general bearings	81·0	5·0		14·0		
" " "	81·0	5 0	14·0			
" " "		10·0	10·0	80·0		
" " "		12·0		88·0		
Bearings for light work	85·0	5·0	10 0			
" " " "	73·0	9·0	18·0			
" " " "	76·0	7 0	17·0			
" " heavy work	90·0	2·0	8·0			
" " " "	87·0	6·0	7·0			
" " common work	2·0	8·0	2·0		88·0	
Soft alloy for pillow blocks			15·0	85·0		
Vaucher's alloy for lining journals	18·0		2·5	4·5	75·0	

Violet Alloy.—Copper, 75 per cent.; antimony, 25 per cent.

Warne's Alloy.—Tin 37, nickel 26, bismuth 26, cobalt 11 per cent.

White Metal Alloys.—The following alloys are used as lining metals by the Eastern Railroad of France:

Number.	Lead.	Antimony.	Tin.	Copper.
1	65	25	0	10
2	0	11·12	83·33	5·55
3	70	20	10	0
4	80	8	12	0

Hard White Metal.—Sheet brass, 32 oz.; lead, 2 oz.; tin, 2 oz.; zinc, 1 oz.

New Inoxidizable White Metal.—According to M. Marlié, an inoxidizable white metal may be made of iron, 10 parts; nickel, 35 parts; brass, 25 parts; tin, 20 parts; and zinc, 10 parts. The alloy is cast and cut in pieces, and the latter are tempered at white heat in a mixture of: sulphuric acid, 60 parts; 1 nitric acid 10 parts; muriatic acid, 5 parts; and water, 25 parts.

Table of White Alloys.

Description.	Silver.	Nickel.	Brass.	Zinc.	Tin.	Lead.	Copper	Antimony.	Bismuth.
	dwts.	lb.	dwts.	lb.	lb.	lb.	lb.	lb.	
Nickel, or German silver		3·0		16·0			1·0		
White copper of China		15·0		13·0			1·0		
Queen's metal				lb. 9·0	2·0			1·0	2·0
Britannia metal			1·0	49·0			1·0	3·5	
White button metal			16·0	2·0	1·0				
Solder for bell metal			2·0		1·5		1·0		
" " brass			1·0		0·6		0·15		
" " tin					1·0	0·5			
" " silver	1·0		0·5						
" " "	1·0		0·3						
" " "	4·0						1·0		
" " Mokume	1·0		0·15						
French coin	835·0						165·0		
M. Piligot's coin alloy	950·0			50·0					
" " "	900·0			100·0					
" " "	800·0			200·0					
" " "	900·0			50 0			50·0		
" " "	800 0			100 0			100·0		
" " "	835·0			72·0			93·0		
Gin shi bu ichi	100·0						30 to 50		

Almonds.—*Jordan almonds* are the finest and most agreeable, and are those ordered in the pharmacopœias. The next in quality are *Valentia almonds*, which, being excellent, and cheaper than the preceding, are commonly substituted for them in preparations. The other varieties of sweet almonds are inferior.

Bitter almonds are a variety imported from Mogadore, characterized by their bitter, nutty flavor, and possessing, when rubbed with water, the odor of peach kernels. They are chiefly used to relieve the flavor of sweet almonds, to flavor confectionery, liquors, etc. Their essential oil is used in perfumery, particularly toilet soaps. In a quantity, bitter almonds are poisonous.

Oil of almonds is obtained, by expression, from both bitter and sweet almonds, the expressed oil of each being equally bland and sweet. The essential oil of almonds is obtained from bitter almonds by distillation. It is highly poisonous.

Almond Balls. See **Cosmetics.**

Blanched Almonds.—Almonds from which the husk or seed coat has been removed. This is effected by soaking them in warm water until the skin can be easily removed by pressure between the thumb and forefinger. They are then peeled, rinsed in cold water, drained and dried. The last is done by either wiping them with a soft towel or by exposure to the air or sun. Unblanched almonds are scarcely ever used in preparations.

Almond Paste. See **Cosmetics.**

Alterant.—A substance added to a color to give it brightness, same as raising.—*(Dyeing.)*

Alteratives.—Tonics and medicines which tend to build up the system and restore and preserve the healthy functions of the body. Blood maker and purifier (used as a substitute for iron tonic, also taken in connection with iron tonic). 1 ounce manganese sulphate mixed with 1 quart of water. Take two tablespoonfuls three times a day.

Alum, Burnt.—Heat the alum in an open vessel to 401° Fah., such as an enameled frying pan. Alum, in small pieces, one hundred and eighty-four parts. To make one hundred parts. Expose the alum for several days to a temperature of about 80° C. (176° Fah.), until it has thoroughly effloresced. Then place it in a porcelain capsule, and gradually heat it to a temperature of 200° C. (392° Fah.), being careful not to allow the heat to rise above 205° C. (401° Fah.) Continue heating at the before mentioned temperature until the mass becomes white and porous, and weighs one hundred parts. When cold, reduce it to fine powder, and preserve it in well stopped vessels.

Alum Cake.—A nearly pure sulphate of alumina.

Alum Chrome.—A double sulphate of chromium and potash. It is obtained as a by-product in the manufacture of artificial alizarine and is coming into use as a mordant. It is not, as some suppose, a mixture of alum and bichromate of potash.

Alum Poultice.—Take of alum (in fine powder) 1 drachm; whites of eggs 2 in number; shake them together until they form a coagulum. Formerly much used in broken chilblains, chaps, sore nipples, chronic inflammation of the eyes, etc., applied on linen, and covered with a piece of fine muslin. This is the formula of the old Dublin Ph.; as also of the London Ph. of 1788.

Aluminum, to Braze. See **Brazing.**

Aluminum, to Solder. See **Soldering.**

To plate with. See **Electro-metallurgy.**

Amalgam.—A mixture of mercury with certain metals, as zinc, copper, or tin. Amalgams are formed in three ways. 1. By a direct union with the metal. 2. By adding mercury to the solution of a metallic salt. 3. By adding the metal to a solution of a mercury salt. Mercury unites with a large number of metals, forming definite chemical compounds called "amalgams." Some of these are solid, while others exist in a fluid state. It is probable, however, that fluid amalgams merely represent a solution in excess of mercury of some fixed compound of mercury with another metal, inasmuch as when a quantity of such fluid amalgam is pressed through the pores of a chamois leather bag, a small portion of mercury passes through, leaving behind the solid amalgam, which, on examination, is generally found to have a fixed chemical constitution. The fluidity of an amalgam seems therefore to depend upon the presence of an excess of mercury over and above the amount theoretically required to enter into combination with the other metal.

The following are some of the most important amalgams:

Copper Amalgam.—There are several methods of preparing this, the following being, perhaps, the best: A mixture of finely divided metallic copper (obtained by precipitating copper sulphate with metallic iron) and mercurous sulphate is triturated under hot water for half an hour. After this the water is repeatedly changed until it is no longer blue. The mass is then dried, kneaded well, and allowed to harden, when it consists of an amalgam of 7 parts mercury with 3 of copper. The peculiarity of this amalgam is its property of softening when kneaded, and becoming quite hard again after standing some hours. It has been used by Parisian dentists as a stopping for decayed teeth, though, owing to the poisonous nature of the copper, it is not to be recommended for this purpose.

Gold Amalgam.—This is formed when mercury is heated with powdered gold or gold foil. It consists usually of two parts of gold to one of mercury. It has been found native near Mariposa, in California, and in the platinum region of Colombia.

The readiness with which mercury combines with gold is made use of in the extraction of the latter from its ores. The ore is crushed in an iron mortar, or battery, as it is termed. Water is introduced into each battery by a number of pipes. Mercury is placed in the batteries in small quantities, and unites with the gold as the latter is liberated by the crushing process. The larger portion of the amalgam is afterward found in the batteries, adhering to the plates, the remainder being caught by inclined plates placed outside the battery. The plates are cleaned by scraping off the adhering amalgam, first gently with a knife, and finally with a thick piece of hard gum or rubber, which scrapes the surface closely without cutting or scratching it. The plates are then washed with water, and prepared for use again by sprinkling mercury over them, and spreading the same evenly by means of a cloth, thus forming a freshly amalgamated surface.

Iron Amalgam.—Iron will not unite with mercury under ordinary conditions. Small quantities of an iron amalgam have, however, been formed by immersing sodium amalgam (containing 1 per cent. sodium) in a clear, saturated solution of ferrous sulphate.

Silver Amalgam.—This compound is formed by the union of mercury with finely divided silver. Native silver amalgam has been found at Moschellandsberg, in the Palatinate, and in several other places. Mercury is used for silver extracting, in a process somewhat similar to that described above for the extraction of gold.

Sodium Amalgam.—Sodium and mercury combine readily under ordinary conditions by being brought into contact one with another. The union is attended with much hissing and

spluttering, and with a considerable evolution of heat.

Tin Amalgam.—Tin and mercury combine readily at ordinary temperatures. If 3 parts mercury be brought into contact with 1 of tin, 6-sided crystals of tin amalgam are formed. Tin amalgam is used for silvering looking glasses. When pulverized and rubbed on the polishing stone, it forms a kind of mosaic silver. Electric amalgam may be made by melting tin and zinc together in various proportions in a porcelain crucible. The mixture is well stirred up, and when on the point of solidifying, the mercury is added and worked into the mass. The whole is next transferred to a mortar warm enough to keep the amalgam soft while it is well worked together, after which a piece of tallow or lard, not quite equal in bulk to the mass, is kneaded in until the amalgam attains the proper consistency.

Zinc Amalgam is formed by mixing and triturating zinc filings with mercury, at a heat somewhat below the boiling point of the latter. It is usually prepared by pouring mercury into zinc at the temperature at which the latter is just kept in a fused state. Care must be taken to keep the liquid stirred, and to add the mercury slowly and in as fine a stream as possible.

Amalgam for Coating Plastic Castings. 1 part tin, 1 mercury, 1 bismuth. The mercury is mixed with the white of an egg, and added to the tin and bismuth when they are thoroughly melted and blended. The alloy while still hot forms a pasty liquid, which should be applied with a brush. (Güttier.)

Electric Machines, Amalgam for.—1. Melt 8 parts of zinc, add 2 parts tin, place 4 parts heated mercury in a wooden box lined with chalk. Pour in the alloy, cover the box, and shake until cool. Bisulphide of tin is highly recommended as a substitute for amalgam.

2. The rubbers of glass electric machines are coated with amalgam, consisting of equal weights of tin and zinc melted together, with twice their joint weight of mercury added during fusion.—(*Kienmayer.*) Another amalgam is tin 1, zinc 2, mercury 4. For ebonite disks the amalgam should be softer than for glass. Grease is mixed with the powdered amalgam to give it softness and make it stick. In France bisulphide of tin is used.

Mackenzie's Amalgam.—20 parts of lead and 10 parts of bismuth are melted separately and thrown into fresh crucibles, each containing 5 parts of mercury. When required for use, rub the two amalgams together.

Amalgam for Spherical Mirrors.—Bismuth, 40 parts; mercury, 13 parts.

Amalic Acid.—A compound obtained from caffeine. Red, blue, and violet-color may be obtained from this material, but it is high priced.

Amandine. See **Cosmetics.**

Amber, to Bend.—Drop it into hot beeswax. After it has been immersed for a few minutes, remove it, and, holding it before the fire, bend it to the desired shape.

Amber, to Cement. See **Cements.**

Amber, Factitious.—*Prep.* Dissolve shellac in an alkaline lye, then pass chlorine through the solution until the whole of the lac is precipitated. After washing in water, this must be melted and kept over the fire until it runs *clear*, taking care that it does not burn; it should then be poured into moulds of the size of the pieces required.

Amber, Imitation of.—A fictitious amber is prepared by melting pure bleached shellac, and keeping it over the fire until it runs clear, with care to prevent burning. It may be poured into moulds of the size of pieces required. The operation requires considerable management. The darkest and hardest pieces of gum copal are also substituted for amber. The copal may be fused with the shellac.

Amber, Soluble.—Fragments of amber are cautiously heated in an iron pot, and as soon as it becomes semi-liquid, an equal weight of pale boiled linseed oil, previously made hot, is very gradually stirred in, and the whole thoroughly blended. Used as a cement for glass and earthenware, and thinned with oil of turpentine to make varnishes. It will keep any length of time if preserved from the air.

Amber Varnish. See **Varnishes.**

Amber, to Work.—1. Amber in the rough is first split and cut rudely into the shape required by a leaden wheel worked with emery powder, or by a bow saw having a wire for the blade, tripoli or emery powder being used with it. The roughly formed pieces are then smoothed with a piece of whetstone and water. The polishing is effected by friction with whiting and water, and finally with a little olive oil laid on and well rubbed with a piece of flannel, until the polish is complete. In this process the amber becomes hot and highly electrical; as soon as this happens it must be laid aside to recover itself before the polishing is continued, otherwise the article will be apt to fly into pieces.

2. Amber is worked in a lathe, polished with whiting and water or oil, and finished off by friction with flannel. During the operation the pieces often become hot and electrical, and fly into fragments, to avoid which, they should be kept cool, and only worked for a short period at a time.

3. Anoint the edges to be joined with linseed oil, and hold them over a charcoal brazier or near a gas jet until the parts become sticky, taking the precaution to wrap paper round the other parts. Press them together, and hold till cold. Polishing is effected first with whiting and water and then with olive oil and a bit of felt or cloth.

Ambergris.—*Syn.* AMBERGRISEA.—(*Lat.*) AMBREGRIS (*Fr.*) A substance found in irregular masses floating on the sea in tropical climates, and supposed to be a morbid secretion of the liver or intestines of the spermaceti whale. *Prop.* Dirty pale color; very odorous; lighter than water; largely employed in perfumery.

Ammonia, Spirit of.—1. Take of quicklime, 12 ounces (troy); water (to slake), 6½ fluid ounces; to the slaked lime add of sal ammoniac (in fine powder), 8 ounces (troy); put the mixture into a glass retort furnished with a tube reaching nearly to the bottom of a bottle (surrounded with ice or very cold water) containing rectified spirit, 1 quart; and distill, by the heat of a sand bath, as long as gas passes over. The product must be kept in a well stopped bottle, and in a cool place. Sp. gr., about 0·845. Very pungent and caustic; chiefly employed in perfumery, to make other preparations, particularly ammoniated perfumes, etc.

2. Take of carbonate of ammonia, 1½ ounce; rectified spirit, 1 pint; dissolve. Less caustic and pungent than the preceding, owing to the ammonia being in the carbonated state.

3. The spiritus ammoniæ of the London Ph. of 1836 was made from sal ammoniac 10 ounces (troy); carbonate of potash, 16 ounces (troy); rectified spirit, 3 pints; water, 3 pints; three pints only being drawn over by distillation.

Ammonia, Compound Spirits of.—For compound spirits of ammonia, the aromatic spirits of ammonia are usually dispensed by druggists.

Carbonate of ammonium	40 parts.
Water of ammonia	100 "
Oil of lemon	12 "
Oil of lavender flowers	1 "
Alcohol	700 "
Distilled water sufficient to make	1,000 "

Ammoniacum. See **Gums.**

Amorphous.—A term applied to bodies which do not have a crystalline form.

Amykos.—A tooth wash, 420 grms. cloves boiled in 1 gal. of water in which 420 grms. of pure glycerine are dissolved, and to which 210 grms. of borax are added. (*Hager.*) [Not recommended.]

Analysis.—The determination of the percentage proportions of the elements existing in a compound material. The analysis is then said to be quantitative. Qualitative analysis simply demonstrates the presence of certain elements by their reactions on other elements or bodies, without determining their relative proportions.

Anatomical Preparations and Natural History Specimens.—*Preserving Anatomical Specimens for a Private Museum.*—Bones and skulls may be prepared by boiling them for some hours in water containing potash, which process, I know from experience gained in preserving specimens for my own museum, quickly causes the flesh to become detached. Another way is to carefully remove the flesh with dissecting apparatus, and then to place the specimens in weak brine, in order to draw away any blood from the bones; next wash them in fresh water, and lay them out to dry. Gullets, stomachs, windpipes and intestines may also be put into weak brine and then dried. At sea, in the case of the albatross, I have preserved these objects by simply cleaning them, blowing them out, making fast the ends with a clove hitch, and hanging up to dry. A coat of varnish will finish them off. All soft parts should be preserved in proof alcohol. Fishes and reptiles should be preserved whole in it, having first made very carefully an incision in the under part to facilitate the introduction of the spirit; or, if at its full strength, it would harden the exterior and not reach the entrails. Neglecting to make these incisions results, I have frequently found, in the putrefaction of the internals. With large specimens the natural juices quickly weaken the spirit, which should be added to until it keeps its strength. The one great advantage of alcoholic specimens is, that at any time they can be removed from the preserving jars and examined in their entirety. On no account should they be allowed to come into close contact with the sides of the glass or jar, and they should invariably be suspended by a strong thread, the end of which should not protrude above the cork or stopper.—*C. L. Wragge, in English Mechanic.*

Preparations for Preserving Specimens.—1. Nearly saturate water with sulphurous acid and add a little creosote.

2. Dissolve chloride of lime, 4 parts, in water 100 parts, to which 3 per cent. of hydrochloric acid has been added.

3. Dissolve corrosive sublimate, 1 part, and sodium chloride, 3 parts, in water, 100 parts, to which 2 per cent. of hydrochloric acid has been added.

4. Babington's: 1 pint wood naphtha, 7 pints water.

5. Burnett's: 1 lb. zinc chloride, 1 gal. water; immerse for 2 to 4 days, and then dry in the air.

6. Morrell's: 14 oz. arsenious acid, 7 oz. caustic soda, 20 fl. oz. water, and sufficient carbolic acid to produce opalescence when the mixture is stirred; add water to make up to 100 fl. oz. Used for general disinfecting and embalming purposes.

7. Muller's: 2 to 2½ oz. bichromate of potash, 1 oz. soda sulphate; add water to make up to 100 fl. oz.

8. Mix ammonia with 3 times its weight of water and rectified spirit.

9. Ammonium chloride, 1 part; water 10 or 11 parts. For muscular parts of animals: zinc sulphate, 1 part; water, 15 to 25 parts. Used for muscles and cerebral masses.

10. Passini's: 1 oz. mercury chloride, 2 oz. sodium chloride, 13 oz. glycerine, 118 fl. oz. distilled water.

11. Réboulet's: 1 oz. saltpeter, 2 oz. alum, 4 oz. calcium chloride, in 16 to 20 fl. oz. water; dilute according to need.

12. Seseman's: Dr. Seseman states that a corpse may be made to retain the natural form of expression for months by:

13. Injecting into it a solution consisting of 4 to 5 per cent. of aluminum chloride dissolved in a mixture of 2 parts alcohol of 90 per cent. and 1 part glycerine; or

14. Painting the entire epidermis with vaseline. The quantity of liquid required for injection is in the proportion of 1-10 to 1-7 of the weight of the corpse.

15. Thwaites': 1 oz. spirit of wine saturated with creosote, rubbed up with chalk into a thin paste, and 16 oz. water gradually added.

16. Von Vetter's: 7 oz. glycerine at 36° Tw. (22° B.), 1 oz. raw brown sugar, and ½ oz. niter; immerse for some days.

17. Gannel's: Sodium chloride and alum, of each ½ lb.; niter, ½ lb.; water, 1 gal.

18. Goadsby's: Bay salt, 2 oz.; alum, 1 oz.; mercury bichloride, 1 gr.; water, 1 pt. 4 oz.

19. Bay salt, ¼ lb.; bichloride of mercury, 1 gr.; water, 20 fl. oz.

20. Bay salt, ¼ lb.; arsenious acid, 10 gr.; water, 20 fl. oz. Dissolve by heat.

21. To the last add 1 gr. bichloride of mercury.

22. Stapleton's: Niter, 1 dr.; alum, 2¼ oz.; water, 1 qt. For pathological specimens.

23. Beasley's (for feathers): strychnia, 16 gr.; rectified spirit, 1 pt.

Preserving Natural History Specimens.—1. When ready, wipe the fish and place it in the following solution, and it will keep for years if good alcohol be used: Alcohol (95 per cent.), 8 parts; distilled water, 2 parts.

2. If the fish are small, three or four days suffice to harden them, and the following is a better solution for them, viz: Alcohol, 6 parts; distilled water, 2 parts. Reptiles, rodentia, etc., can be also preserved in the same manner. The first alcoholic bath can be used over and over again for the same purpose, if strained.

3. Take of chloral, in crystals, one ounce, and dissolve it in five ounces of distilled water: Alcohol (95 per cent.), 1½ oz.; glycerine, 1½ dr.; rock salt, 15 gr.; saltpeter, 30 gr. Dissolve the glycerine, salt, and saltpeter in the alcohol, and when well mixed add to the chloral solution, shake well till thoroughly incorporated, filter, and it is ready for use.

4. The following solution for larvæ of insects, spiders, and other small, delicate objects, will be found very valuable: Glycerine, 1 oz., common salt, 1 dr.; saltpeter, 1 dr.; distilled water, 8 oz. Mix well together. When wanted for use, take two ounces of pure alcohol and add one ounce of the mixture, shake well and filter.

5. For the preservation of tadpoles, young frogs, salamanders, and similar objects, take 1 pound sulphate of zinc, 2 drachms burnt alum and mix well together.—*Sci. Am.*

Anatomical Preparations, Fluid for.—(Objects of natural history, etc.)

1. Saturate water with sulphurous acid, and add a little creosote.

2. Dissolve 4 parts of chloride of tin in 100 parts of water, to which 3 per cent. of muriatic acid has been added.

3. Dissolve 5 or 6 parts of corrosive sublimate in 100 of water, to which 2 per cent. of muriatic acid has been added.

4. Mix together one part of ammonia water (strong) with three times its weight (each) of water and spirit of wine.

Remarks.—These fluids are used by immersing the objects therein, in close vessels. The third formula is apt to render animal substances very hard.—*Cooley.*

5. To preserve anatomical specimens, immerse in a saturated solution of 100 parts alum with 2 parts saltpeter. The article at first loses color, but regains it again in a few days, when it is removed from the liquid and kept in a saturated solution of alum and water only.

Animals, to preserve soft and delicate ones.—(Carpenter) Glycerine, 1 part; alcohol, 1 part; 8 to 10 parts sea water.

Bones, to Clean and Bleach. See **Bleaching** and also **Cleansing.**

Preservative for Insects and Animal Tissues.—Glycerine, alcohol, distilled water, equal parts.

Insects, to Preserve.—1. Laboulbene recommends for the preservation of insects in a fresh state plunging them in a preservative fluid consisting of alcohol with an excess of arsenious acid in fragments; 1½ pint alcohol will take about 14 troy grains of arsenic. The living insect, put into this preparation, absorbs about 3-1000 of its own weight. When soaked in this liquor and dried, it will be safe from the ravages of moths, *Anthrenus* or *Dermestes.* This liquid will not change the colors of blue, green or red beetles if dried after soaking from twelve to twenty-four hours. *Hemiptera* and *Orthoptera* can be treated in the same way. The nests, cocoons, and chrysalids of insects may be preserved from injury from other insects by being soaked in the arseniated alcohol, or dipped into benzine or a solution of carbolic acid or creosote.

2. For spiders, puncture them and steep for several days in a strong alcoholic solution of pure phenol, and then in dilute alcoholic glycerine. Or use a saturated solution of salicylic acid in glycerine; dry carefully.

Taxidermy, Preparations for.— Arsenical Soap. White arsenic, 2 lb.; white soap, 2 lb.; sugar in powder, 12 oz.; salt of tartar, 12 oz.; chalk in powder, 6 oz.; camphor, 5 oz. Slice the soap, and melt in an earthen vessel, with water, over a gentle fire, keeping it stirred with a wooden spatula. When melted, put in the sugar, salt of tartar, and chalk. Remove from the fire, and well stir and mix in the arsenic. This soap should be kept in a well closed glass or earthen vessel.

Corrosive Sublimate Solution. — Corrosive sublimate, 1 drachm; spirit of salt, 2 drachms; spirits of camphor, 6 oz. Dissolve the sublimate in the spirits of camphor, and then add the hydrochloric acid. This solution is chiefly used for the skins of quadrupeds, to the inner side of which it is to be applied with a brush or sponge before stuffing.

Preservative Powder—White arsenic, 2 drms.; corrosive sublimate, 2 drms.; nutgalls, 1 oz.; capsicum in powder, ½ oz.; sal ammoniac, ½ oz.; camphor in powder, 6 drms. Well mixed together.

Dr. Richardson's Powder.—Nut galls coarsely powdered, 2 oz.; camphor powdered, 1 oz.; burnt alum, 1 oz. Well mixed, and if used in a hot climate, with the addition of 2 drms. of either oxymuriate of mercury or arsenic. One of these powders is generally used for dressing the skins of birds.

Preservative Compound.—Oak bark, powdered, 4 oz.; burnt alum, powdered, 3 oz.; sublimate of sulphur, 2 oz.; camphor, powdered, ½ oz.; oxymuriate of mercury, ½ oz.; well mixed. This compound is used for dressing the skins of reptiles and fishes before stuffing.

Preservative Baths.—Bay salt, 4 oz.; alum, 2 oz.; corrosive sublimate, ½ drm., dissolved in 1 quart boiling water, and when cold, strained through blotting paper. Or, one half spirits of wine and one half boiled water. These baths are for the immersion of small reptiles, such as lizards, snakes, etc., which may be kept in them for an unlimited length of time, in glass bottles or jars well stoppered, or corked and cemented down. See also **Bird Skins.**

Anhydrous.—Free from water, that is not only free from water in a state of mechanical mixture, but also as chemically combined. Unslaked lime for example, CaO, is anhydrous, but mixed with water chemical combination takes place and CaOHO results. Compounds of this kind are then said to be hydrated. The term anhydride is used to designate an anhydrous substance.

Aniline. — Phenylamine. A volatile organic base first noticed in empyreumatic bone oil and afterward obtained from coal tar as a product of various processes attending the destructive distillation of organic bodies.

Aniline, Solvent for.—In converting red aniline into a dye for staining wood, a very weak solution of alcohol is sufficient to hold the dye after it is once dissolved. In all probability if the color is first dissolved in a small quantity of strong alcohol and then diluted with wood spirit, the result will be the same. It has been found by experiment that a very considerable proportion of water can be added to the dye without causing the alcohol to deposit it. Glycerine can also be used for dissolving aniline. A German writer says that "the aniline colors may be made to dissolve in water by dissolving them in a solution of gelatine dissolved in acetic acid." The aniline color is added to this solution, which is made like a sirup in thickness. It is stirred until an evenly colored paste is obtained. Then the mixture is heated in a glue pot for some little time.

Animals, to Clean. See **Cleansing.**

Animals, to Preserve. See **Anatomical Preparations.**

Animation, Suspended.—*Syn.* Asphyxia. *Causes.* Various; hence it has been divided into four varieties, viz.:

1. From suffocation produced by hanging and drowning.
2. From suffocation produced by the inhalation of irrespirable gases or vapors, as the fumes of charcoal, fixed air, etc.
3. From strokes of lightning or electricity.
4. From extreme cold. (Dr. Mason Good.)

No general rules can be given exactly suitable to each case; but the reader is referred to **Drowning.** Whenever it is possible to procure medical aid, it should be immediately sought, as the delay of a single minute may put the case beyond the reach of assistance. The following valuable remarks on asphyxia, from the pen of an eminent physician, may, however, be well introduced here:

The treatment of asphyxia involves an attention both to the functions of respiration and to that of the true spinal marrow. The object, doubtless, is to effect a restoration of the respiratory and circulatory functions, the former of which has been arrested by the external conditions of the patient; the latter, by the contact of morbidly carbonized blood with the capillary vessels of the lungs. The first thing to be attempted is the restoration of warmth by active friction with warm hands, etc.; the second, the imitation of artificial respiration, by any means at hand, of which none is better, usually, than the action of alternate pressure and its relaxation, applied to the thorax and abdomen, so as to induce expiration first, and inspiration immediately by the play of the elasticity of the ribs. The third effort is made by suddenly dashing cold water on the face and general surface, previously warmed by the frictions, in the hope of inducing a more decided inspiration. Artificial respiration must be attended to, if these measures, very promptly enforced, fail; and unless the proper apparatus be present, the mouth of another person, of robust make, is to be applied to that of the asphyxiated person, covered with a handkerchief, the nostrils being closed. (Dr. Marshall Hall.)

Anime. See **Gums.**

Anisette. See **Liquors.**

Annealing.—For a small quantity, heat the steel to a cherry red in a charcoal fire, then bury it in sawdust, in an iron box, covering the sawdust with ashes. Let it stay until cold. For a larger quantity, and when it is required to be very soft, pack the steel with cast iron (lathe or planer) chips in an iron box as follows: Having at least half or three-quarters of an inch in depth of chips in the bottom of the box put in a layer of steel, then more chips to fill spaces between the steel and also the half or three-quarters of an inch space between the sides of the box and steel, then more steel; and lastly, at least one inch in depth of chips, well rammed down on top of the steel. Heat the whole to and keep at a red heat for from two to four hours. Do not disturb the box until cold.

Annealing Chains.—Get your chain to a cherry red or bright red heat (it need not remain in the furnace or fire afterward), then bury in charcoal dust or fine ashes until thoroughly cold. Chains are generally made from "best best" iron, and are more liable to crystallization than more common iron would be, as it is purer.

Annealing Steel.—It is now recommended as a good method of annealing steel to let it remain in the fire until red hot, as it heats more evenly, then take it from the fire and carry it to some dark place, allowing it to cool in the air until the dull red is no longer obvious in the dark, and finally cooling it off in hot water. This process is called the "water anneal."

Water Annealing.—First heat the steel to a red heat; let it lie until nearly black hot, then throw into soap suds. Steel treated in this way can be annealed softer than by putting it into the ashes of a forge.

Annotta.—Annotto, Annatto, Annatta, Arnatto, Arnotto. A coloring matter forming the outer pellicle of the seeds of the *Bixa orellana (Linn).*, an exogenous evergreen tree, common in Cayenne and some other parts of tropical America, and now extensively cultivated in both the East and West Indies. It is scarcely soluble in water, freely soluble in alcohol, ether, oils, and fats, to each of which it imparts a beautiful orange color. Its most important property is the affinity of its coloring matter for the fibers of silk, wool, and cotton.

Anodynes.—Medicines which prevent the increase of pain and cause it to decrease.

Anodyne for Stupefying the Senses.—Take 1¼ drms. tincture lupuline (hops), 1¼ drms. tincture henbane, 2½ drms. camphor water. This is a substitute for opium, and where that cannot be administered, a teaspoonful of this anodyne every two hours will answer.

Anthrapurpurine.—A color closely connected with alizarine, discovered first by Perkin, and afterward independently obtained by Auerbach, under the name isopurpurine. With appropriate mordants, it gives purer and brighter reds than those obtained by alizarine alone. It is now always present in the so-called "alizarine for reds."

Antacids.—Medicines that neutralize the acid of the stomach, and thus tend to remove heartburn, dyspepsia, and diarrhœa. The principal antacids are the carbonates of potassa, soda, ammonia, lime, and magnesia. Ammonia is the most powerful, and when the acidity is conjoined with nausea and faintness, is the best; when great irritability of the coats of the stomach exists, *potash* is preferable; when accompanied with diarrhœa, *carbonate of lime* (prepared chalk); and when with *costiveness, magnesia.* See **Absorbents.**

Anthelmintics.—Medicines that destroy worms.

Anti-attrition. See **Lubricants** and **Alloys** *for Journals.*

Antichlor.—Sodium sulphite. So called because it is used to remove the last traces of chlorine from paper pulp.

Antidotes. See **Poisons, Antidotes for.**

Anti-ferment.—A substance sold in the cider districts for the purpose of arresting fermentation.

1. It generally consists of sulphite of lime in powder, or a mixture of equal parts of the sulphite and powdered mustard.

2. Mix together 14 lb. of mustard seed with 1 lb. cloves, and bruise them well without drying.

Use.—A portion of either of the above added to cider or perry tends to allay the fermentation, when it has been renewed. The second may be used for wine and beer as well as cider.

Caution.—In the above the sulph*ite* must be employed, not the sulph*ate*, which is quite a different article.

Anti-friction Metal. See **Alloys.**

Anti-incrustations. See **Incrustations.**

Antimony, Butter of.—Thiss ubstance is of great use in many mechanical operations. It is obtained by the action of chlorine on antimony or by heating the trisulphide with mercuric chloride. It is diluted with alcohol, as water causes a precipitation.

Anti-rust Varnish. See **Varnishes.**

Antiseptics.—The use of chemical antiseptics has long been known, common salt being a very generally employed agent of this class.

1. *Herzen's.*—The quarter carcasses are soaked for 24 to 36 hours in a solution composed of 3 parts borax, 2 parts boracic acid, 3 saltpeter, and 1 salt, in 100 parts water; they are then packed with some of the same. Before use they need 24 hours' soaking in fresh water.

2. *Reynoso's.*—The meat is subjected to the action of compressed nitrogen, carbonic oxide, etc. After being kept in this state for 40 days, the freshness has been so maintained that blood has flowed from the joints.

3. *Richardson's.*—Dr. Richardson made some test experiments with meat treated with various antiseptics under a temperature varying from 45° F. (7° C.) to 110° F. (43° C.), for a period of 75 days. The results may be summarized thus: Methylene: preservation, good; color, imperfect. Methylal: faint taint of decomposition. Cyanogen: preservation, excellent; color, perfect; structure, firm. Sulphurous acid: some tainted; color, dark. Sulphurous acid and lime juice: some tainted; color, indifferent. Sulphurous acid and glucose: some tainted; structure, dense. Nitrate of methyl: preservation, good; color, yellowish; structure, firm. Formates: entirely fresh, and excellent in color.

4. *Estor's.*—This consists in treatment with sulphurous acid and chlorine in succession.

5. *Gamgee's.*—The animals are killed by inhaling carbonic acid, etc., and the carcasses are kept in an atmosphere of carbonic or sulphurous acid. This does not prevent decomposition where bruises exist.

Antiseptic Soap. See **Soaps.**

Ants, to Destroy.—Flour of sulphur, ½ lb.; potash, 4 oz.; set in an earthen vessel, over the fire, till dissolved and united. Afterward beat to a powder, infuse a little of the powder in water, and sprinkle in places infested by ants.

Black, to Destroy.—A few leaves of green wormwood, scattered among the haunts of black ants, will drive them away.

Red, to Destroy.—1. Powdered borax sprinkled around the infested places will exterminate both red ants and black ants. Powdered cloves is said to drive them away. Another plan is to grease a plate with lard, and set it where these

insects abound. They prefer lard to anything else, and will forsake sugar for it. Place a few sticks around the plate for the ants to climb up on. Occasionally turn the plate bottom up over the fire, and the ants will fall in with the melted lard.

2. Use a small amount of oil of turpentine, run into the cracks with an ordinary sewing machine oil can.

3. Set a quantity of cracked walnuts or shell barks on plates, in the closet where these ants congregate. The ants will collect on the nuts, in myriads. Turn nuts and ants together into the fire, and put fresh nuts on the plates. Then powder camphor, and put in the holes and crevices of the closet.

Aperients.—Under this head are commonly classed all those substances and agents which, in moderate doses, gently, but completely, open the bowels; and which, in this respect, rank between simple laxatives on the one hand and the stronger purgatives and cathartics on the other. Among these may be named, as useful examples. (Dissolve all in water.)

1. Cream of tartar,	1 to 3 dr.	
2. Epsom salt,	1 dr. to 1	oz.
3. Glauber's salt,	¼ to 1	"
4. Rochelle salt,	¼ " 1	"
5. Tasteless purging salt,	½ " 1	"

6. Sodium phosphate.
7. Seidlitz powders.

Several of the above substances in large doses are active purgatives, or cathartics; and most of them, in small doses, are gentle laxatives.

Aphides, to Destroy.—To destroy common plant lice (*Aphides*) and other insects in the greenhouse and garden, the following remedy has been recommended by M. Cloetz, of the Jardin des Plantes, in Paris: 3½ ounces quassia chips, 5 drachms of stavesacre seeds, powdered and placed in 7 pints of water, and boiled until reduced to 5 pints. Dr. Hull recommends dusting slaked lime on the trees or bushes when the foliage is wet; syringing with soapsuds or tobacco water, or a strong decoction of quassia with soapsuds; also a weak solution of chloride of lime is said by Mr. Andrews to preserve plants from insects if sprinkled over them. The following recipe is also highly recommended in an English horticultural journal as being almost infallible for mildew, scale, mealy bug, red spider, and thrips: 2 ounces flour of sulphur worked into a paste with water, 2 ounces washing soda, ½ ounce of common shag tobacco, and a piece of quicklime about the size of a duck's egg. Pour them all into a saucepan with 1 gallon of water, boil and stir for a quarter of an hour, and let the whole settle until it becomes cold and clear. It should then be poured off, leaving the sediment. In using it add water according to the strength or substance of the foliage. It will keep good for a long time if kept closed.

Aphorisms. See **Photography.**

Apothecaries' Weight. See **Appendix.**

Aprons, Carriage, Dressing for.—Glue, 2 parts; white soap, 4 parts; yellow wax, 1 part; neat's foot oil, 1 part; lampblack, *q. s.* Soften glue, melt over water, dissolve soap in water, *q. s.*, and stir into the glue; add wax in shavings, then oil; lastly, black to color.

Aquafortis.—Nitric acid.

Aqua Reale. See **Liquors.**

Aqua Regia.—So called because it is a solvent of gold. It is made by adding 1 part of hydrochloric acid to 2 parts nitric acid.

Aquariums.—A small and well proportioned aquarium might be about 20 in. long by 4 in. wide by 14 in. deep. Make the frame of stout tin; cut eight strips 14 in. long and four strips 20 in. long. They may all be about 1½ in. wide; now angle them in pair of clamps, and you have the required number for the frame, *i. e.*, four uprights at 14 in.; a piece across top and bottom at each end, 14 in.; and four pieces, 20 in., for top and bottom at sides; solder them fitmly together, being careful to get the frame square. You had better strengthen the corners by angling some short pieces and soldering firmly over them; these will also hide the joints. These pieces may be fancifully cut, unless you intend to case the frame afterward. Having put the frame together, you should have a flange round the inside of the bottom part. Cut a piece of galvanized sheet iron, rather stout in substance, to fit. Bed it firmly in with red lead cement, red and white lead mixed like putty. Tack it here and there with solder to the frame. Before putting in the bottom make the holes and arrangements for fountain and waste, also runaway, and whatever you require. You may now put in the glass, 28 oz., or even 21 oz. will stand the pressure very well; but an accidental knock would be fatal. If you can use plate it will be much better. Bed it firmly in with lead, solder tabs of tin or copper close up at top and bottom. Clear away the superfluous lead, which will squeeze out between the frame and glass neatly, and let it set hard.—*Eng. Mech.*

Aquariums, Cement for. See **Cements.**

Aquariums, Sea Water for. See **Aquariums.**

Aqua Vitæ.—A name now applied chiefly to brandy.

Arbor Dianæ.—Being the materials for making a silver tree.

Directions.—Dissolve the crystals in the blue paper in a tablespoonful of water, and add the contents of the bottle to this solution and allow it to stand aside a little while, when it will form a silver tree in full growth.

Materials.—½ dr. of silver nitrate wrapped in blue paper and 1 dr. of mercury in a small flat bottle packed in a one dozen powder box in cotton wool. Label "Poison."

Archil.—A violet red, purple or blue coloring matter, or dye stuff, obtained from several species of lichens, but of the finest quality from Roccella tinctoria, and next from R. fuciformis.

Arenaceous.—That which has the properties of sand.

Argentan. See **Alloys.**

Argentin. See **Alloys.**

Argillaceous.—That which has the property of clay.

Argiroide. See **Alloys.**

Argusoid. See **Alloys.**

Armenian Cement. See **Cements.**

Army Worm.—Take a pail of water, with a half gallon of salt well stirred into it; with a small broom or bunch of feathers sprinkle well a row of corn just ahead of the bugs, taking care that the ground between the hills is well sprinkled with the brine. The bugs generally commence in a corn field on one side and go through from row to row with almost as much precision as the plowman plowing the corn. This remedy is merely mentioned, as, should the chinch bugs appear in various places in the field at once, the remedy would be of little avail, and the brine, if too strong, would undoubtedly injure the plants.

Aromatic Vinegar. See **Vinegars.**

Aromatique.—Spirit (90 per cent.) 50 grms.; sugar, 45 grms.; extractive matter, 4 grms.; (composed of cinnamon, cloves, galangal, zedvary, angelica, anise), water, 81 grms. Recommended for all derangements of the digestive organs.—*Hager.*

Arrack. See **Liquors.**

Arsenic, Simple Test for in Wall Paper, etc.—To identify the presence of arsenic in wall paper, dissolve the coloring matter off in a little ammonium hydroxide, pour off this solution on a piece of glass, and drop into the liquid a crystal of silver nitrate. A yellow coloration around the crystal indicates the presence of arsenic. This will answer as a general rule, but it is only a rough test. Marsh's test is better.

Arsenide.—A combination of arsenic with a metal (including hydrogen) in definite proportion.

Arsenite.—A salt of arsenious acid.

Asbestos.—The name given to several varieties of amphibolic and augitic minerals. It is now used to a large extent in the manufacture of non-conducting and fire-proof articles, as boiler coverings, paint, theater curtains, etc.

Ashberry Metal. See **Alloys.**

Asphalt.—Native bitumen.

Asphaltum Liquid.—1. Scio turpentine, 2 oz., melt; add asphaltum (in powder), 1 oz.; mix, cool a little and reduce with hot oil of turpentine.

2. (*Wilson's.*) Asphaltum, ½ lb., melt; add of hot balsam of copaiba, 1 lb.; and when mixed thin with hot oil of turpentine. Both are used as black japan or varnish and as a glazing color by artists.

Asafœtida. See **Gums.**

Asteroids. See **Pyrotechny.**

Asthma.—The most popular remedies for this disorder are those used by inhalation, and experience demonstrates them the most effective. The following formula has no superior:

	Drachms.
Grindelia	8
Jaborandi	8
Eucalyptus	4
Digitalis	4
Cubebs	4
Stramonium	16
Nitrate of potash	12
Cascarilla bark	1

The ingredients should be in fine powder, and thoroughly dry before mixing. The composition is used by burning from one-fourth to one-half teaspoonful, and inhaling the smoke. The nitrate of potash is dissolved in water, and the powder moistened with it and dried.

Asthma Cigarettes.—

	Grammes.
Tobacco	90
Extract of stramonium	5
Iodide of potassium	5
Nitrate of potassium	5
Alcohol	45

Mix, dry, and make a hundred cigarettes.

Asthma Pastils (Danl. White & Co., New York), according to the analysis of Dr. Fleck, contain 20·1 % saltpeter, 3·5 % impure scammonium resin, 35·0 % gum and sugar, 40 % charcoal powder, leaves and stems of some plant.

Asthma, For.—Dr. W. T. Plant, of Syracuse, N. Y., says an asthmatic neighbor of his gets much relief from inhaling the smoke of a teaspoonful of the following combination: Stramonium leaves, green tea dust, each, ¼ oz.; lobelia, 1½ oz.; mix together and wet up with a saturated solution of nitrate of potassium. Dry thoroughly and keep in a close can or well stoppered bottle.—*Pharm. Era.*

Astringents.—*In Medicine.* Substances that constrict the animal fiber, and coagulate albumen. When employed to check bleeding, they are called styptics. The principal vegetable astringents are catechu, kino, galls, and oak bark: the principal mineral astringents are sulphate of iron, nitrate of silver, chloride of zinc, sulphate of copper, acetate of lead, etc.

Dyeing.—A numerous and important class of vegetable substances, indispensable in cotton dyeing; the first operation of which generally consists in saturating the cloth or yarn with the extract or solution of some one of these bodies. They include, divi-divi, galls, sumac, catechu, cutch or gambier, myrobolans, valonia cups, pomegranate husks, hemlock bark, babool or bablah, kino, and others of less importance. The value of these depends on the presence of one constituent, tannin, which exists in them all, but in different proportions.

Attrition.—The rubbing of bodies, one against another, so as to destroy the surfaces.

Aurantia.—A fine orange color, which is scientifically known as the ammonia salt of hexanitro diphenylamin. It is generally sold as a brick red color; is soluble in water and alcohol. It dyes good orange shades on silks and woolens.

Aureosine.—An artificial dye of the phthaleine class, first obtained by Bouchardt and Girard. It dyes light rose shades on silk, if in a dilute solution, but if more concentrated gives a reddish brown. In either case the dyed goods have a greenish yellow reflection.

Autographs.—One of the best tests of autographs is the color of the ink. In genuine ancient writings the fading of the ink is irregular; in forged documents the ink has the same color throughout, and the most ingenious of forgers have been unable to overcome this difficulty.

Avoirdupois Weight. See **Appendix.**

Awnings, to Remove Mildew from. See **Cleansing, Mildew.**

Awnings, to Waterproof. See **Waterproofing.**

Axle Grease. See **Lubricants.**

Ayer's Pills.—Ayer's pills consist of pepper, colocynth, gamboge (*gutti*), and aloes.

Ayer's Hair Vigor.—A solution of 0·6% lead nitrate.

Azote.—Old name for nitrogen.

Azuline.—A blue coloring matter produced by the action of a high temperature upon a mixture of aniline and rosolic acid. After purification it appears as a reddish mass, with golden reflections. It produces upon silk and wool shades similar to those obtained from the aniline blues.

Azure. See **Pigments.**

Azurine.—An aniline blue color of a very deep shade, *approaching to indigo.* It must not be confounded with azuline, which is different in shade, and prepared by an entirely different process.

Babbitt Metal. See **Alloys.**

Badigeon.—Anything used by artisans to cover defects in their work. See **Cements.**

Bagasse.—The dry refuse stalks of the sugar cane, as they leave the crushing mill. Often used as fuel in the sugar houses.

Baleen.—The fisher's name for whalebone.

Ball Clay.—Impure variety of kaolin, usually containing more silica. Often called pipe clay.

Balloon Varnish. See **Varnishes.**

Balls, Scouring. See **Cleansing.**

Balm.—Primarily balsam (of which it is a contraction); formerly and still properly applied to anything assumed to be healing, soothing or genial in its action, particularly if also aromatic or fragrant; but chiefly to medicine and liquors supposed to possess these properties.

Balm of Mecca; Balm of Gilead; Balsam of Mecca; Opobalsam.—A fra-

grant oleo-resinous substance obtained from Balsamodendron gileadense (Kunth), a tree growing in Arabia Felix, Asia Minor, and Egypt. It is the 'balm' of the Old Testament. Pure 'balm of Mecca' is freely though not entirely soluble in rectified spirit, but it dissolves more or less completely in the fixed and volatile oils, and the fats. Into these solutions it carries its fragrance and other properties. Cosmetics, oils and pomades, emulsions, washes, etc., may thus be readily impregnated with it.

Balm Water. See **Waters.**

Balsams. See also **Gums.**

Bates' Anodyne Balsam.—Laudanum, 1 part; opodeldoc, 2 parts. Mix.

Ant Balsam.—Dr. Livingston's ant balsam, a German remedy, consists of 72 grns. castor oil, 2 grns. balsam of Peru, and 5 drops oil of bergamot.

Berlin Balsam, for cure of all kinds of sores, burns, cuts, wounds, ulcers, chilblains, etc., is nothing but common glycerine contaminated with a considerable amount of chloride of calcium.

Camphor Balsam; Camphor Liniment.—1. Take of spermaceti, 2 oz.; olive oil, ¼ pint; dissolve by a gentle heat. Add of camphor, cut small, 1 oz.; stir the mixture until nearly cold, and then put it into dumpy, wide-mouthed phials, which should be kept well corked. Only half the above quantity of camphor is sometimes used.

2. As the last, but adding (with the camphor) of oil of origanum (thyme), 1 drm.; oil of rosemary, ½ drm.

Canada Balsam.—The exudation of a fir tree (Abies balsamea), grows usually in Canada.

Balsam of Copaiva.—A light colored resin, used largely for ink, and in making varnish.

Balsamic Cigarettes for Asthma, etc.—The London *Chemists' and Druggists' Compendium* gives the following recipe: Soak strong, unsized paper in solution of saltpeter; this dry, and treat first with tincture of cascarilla, and afterward, when nearly dry, with compound tincture of benzoin; cut into squares of a suitable size, and roll into the form of cigarettes.

Cook's Balsam of Life is a filtered decoction of 20 parts borax in 250 parts water, and 1½ parts pulverized camphor in 1 liter of liquid. Used externally for toothache and all skin diseases.

Balsam of Flowers.—French rose pomatum, 12 oz.; French violet pomatum, 12 oz.; almond oil, 2 lb.; otto of bergamot, ¼ oz.

Glycerine Balsam.—This is designed to whiten and soften the skin, remove roughness, chaps, chiblains, and irritations from common causes. Take white wax (pure), 1 oz.; spermaceti, 2 oz.; oil of almonds, 9 oz. Melt together by moderate heat in a glazed earthenware vessel, and add glycerine (best), 3 oz.; balsam of Peru, ½ oz. The mixture is to be stirred until nearly cold, and then poured into pots. [Instead of balsam of Peru, 12 or 15 drops of attar of rose may be employed.]

A preparation used to soften and whiten the skin, to prevent chaps and chilblains, and to remove the former when present. 1. Take of white wax (pure), 1 oz.; spermaceti, 2 oz.; oil of almonds, ½ pint. Melt them together by a gentle heat, in a glazed earthenware vessel; add of glycerine, 3 oz.; balsam of Peru, ½ oz. Stir the mixture until nearly cold, and then pour it into pots, or china or glazed earthenware boxes.

2. As the last, but substituting 12 or 15 drops of attar of roses for the balsam of Peru.

Balsam of Honey.—Take fine pale honey, 4 oz.; glycerine, 1 oz. Mix by a gentle heat, when cold add alcohol, 1 oz.; essence of ambergris, 6 drops; citric acid, 3 drm. This is intended to remove freckles and discolorations, as well as to improve the general appearance of the skin.

Cosmetic.—1. Take of finest pale honey 4 oz.; glycerine (Price's), 1 oz.; unite by a gentle heat. when cold, add of rectified spirit, 1 fluid oz.; essence of ambergris, 6 drops; and at once bottle it. Used to soften and whiten the skin, prevent chaps, etc.

2. In the last, dissolve of citric acid (pure), 3 drm. Used to prevent and remove freckles and discolorations.

Balsam, Pectoral.—Prep. Tincture of tolu and compound tincture of benzoin, of each, 2 oz.; rectified spirit, 4 oz. Mix. Use. As a pectoral in coughs and colds. Dose. A teaspoonful.

Balsam of Peru.—Prep. and source. Genuine balsam of Peru is obtained by boiling the bark and branches of the Myrospermum peruiferum in water. It should possess the following characteristics: *Pur. and Tests.* 1. Balsam of Peru should have a consistence and appearance resembling treacle, and an aromatic odor between that of benzoin and vanilla.

2. It should be entirely soluble in alcohol.

3. It should undergo no diminution in volume when agitated with water.

4. 1,000 parts of the balsam should saturate exactly 75 grains of pure crystallized carbonate of soda.

5. Its sp. gr. should not be less than 1·150 nor more than 1·160.

Balsam of Tolu.—This substance is obtained from the Myrospermum toluiferum, and when fresh, is a soft, translucent, tenacious, and resinous-looking mass, of a reddish or yellowish brown color, a fragrant odor, and a sweetish taste. It is perfectly soluble in alcohol, forming a transparent solution. By exposure to the air it becomes hard and brittle. It is frequently adulterated, in which case it has a weaker smell, is less soluble in alcohol, and the tincture formed with that fluid is opaque.

Baking Powder. See **Powders.**

Bandoline. See **Hair, the.**

Barbotine.—A very thin slip, composed of clay and water.

Barilla.—The name of an impure soda imported from Spain and the Levant.

Bark, Jesuits'.—Cinchona Bark.

Barrels, to Age.—Dissolve 1-3 of a lb. iron sulphate and 1 lb. sulphuric acid in each gallon of water. For external use only.

Barrels, to Cleanse. See **Cleansing.**

Barwood.—One of the hard class of red woods. It is obtained from the western coast of Africa, especially from Angola and Sierra Leone. The wood is compact, and when polished shows an orange red color. When rasped, it is a rough, harsh powder of a red color.

Basic Process.—The process of Messrs. Thomas and Gilchrist, by means of which the phosphorus and sulphur are eliminated from the pig iron, in the Bessemer converter. It consists of the substitution of magnesian limestone or dolomite, which is composed almost entirely of metallic oxide, and is therefore highly basic, for the silicious ganister which is used as a lining in the acid process.

Basil Vinegar. See **Vinegar.**

Bath.—As a dressing in the bath, 3 qts. of water with 2 oz. of glycerine, scented with rose, which will impart a final freshness and delicacy to the skin.

Sulphur Bath.—The patient is placed (not including the head) in a species of box, at the bottom of which is put a piece of hot iron, on which a little sulphur is thrown, great care being taken to avoid the escape of the fumes, and the inhalation of the same by either the patient or the attendants.

The vapor bath consists in vapor being admitted to the apartment, and thus not only is the body immersed in it, but it is inhaled as well. It is used at different temperatures, known by the name of *tepid*, when the temperature varies from 90° to 100°: *warm*, when from 100° to 112°.

and *hot*, from 110° to 130°; but when the vapor *is not* inhaled, the heat of the latter may be raised to 160°.

Bath Metal. See **Alloys.**

Bath Stone.—Bath oolite, a soft stone used in England for building purposes.

potash in hot water to saturation; when cool, pour in very slowly one-fifth its volume of sulphuric acid. For every gallon of solution add about one drachm of bisulphate of mercury. The solution should be made in an earthenware vessel. Great care is necessary in handling the acid and finished solution, as they are very

Baths.

SUMMER AND WARM WEATHER.

Tepid Baths, Fresh and Salt Water.

	Time in Bath.	Frequency.	Period in Day.
Healthy people	Ten minutes	Twice daily	Before breakfast and retiring to rest.
Weak people	Ten minutes	Once daily	Before breakfast.

Cold Baths, Fresh Water.

Healthy people	Ten minutes	Twice daily	Before breakfast and retiring to rest.
Weak people	Five minutes	Once daily	Before breakfast.

Cold Baths, Salt Water.

Healthy people	Ten minutes	Once daily	Before breakfast.
Weak people	Five minutes	Once daily	Two hours after breakfast.

WINTER AND COLD WEATHER.

Tepid Baths, Fresh and Salt Water.

	Time in Bath.	Frequency.	Period in Day.
Healthy people	Ten minutes	Twice daily	Before breakfast and retiring to rest.
Weak people	Ten minutes	Once daily	Before breakfast.

Cold Baths, Fresh and Salt Water, to be Taken in a Properly Warmed Chamber.

Healthy people	Ten minutes	Once daily	Before breakfast.
Weak people	Five minutes	Once daily	Before breakfast.

Dry friction with soft towels after bathing is of great service in promoting the circulation, cleansing the skin, and, if the bath has been a cold one, in preventing chills.

Batteries.—*Approximate Resistance of.*—Variations in the strength of solution and size of electrodes varies the resistance. For bichromate batteries without porous cells, 12 square inches of zinc to ½ ampere may be allowed. The following resistances are sometimes given:

Grove cell		⅛ ohm.
Daniell cell	3 to 5	"
Gravity cell	2 to 4	"
Smee cell	1	"
Leclanche cell	1	"

To Reduce Current of.—Make a wooden reel, and wind uninsulated wire (German silver best) so as to leave a space between each turn. If the current burns the wood, put strips of asbestos under the wire.

Bichromate.—A plunging bichromate battery may be made by clamping together three plates (5 in. wide and 7 in. high), one of zinc and two of carbon, with intervening strips of wood previously soaked in hot paraffine. The zinc is placed between the carbons, and separated from them by strips of paraffined wood ¼ inch thick, placed at the top. The plates are clamped together by two bars of paraffined wood, which project beyond the edges of the plates and are drawn together by two common wood screws so as to closely bind together the upper ends of the plates and the intervening wooden strips. Before putting the elements together, the upper ends of the carbons should be heated and filled with paraffine for about an inch only. This is best done by rubbing on the paraffine while the carbon is hot. The zinc should be amalgamated by dipping it into a solution of nitrate of mercury. Connection is made with the zinc and carbon plates by inserting strips of sheet copper between the plates and the wooden clamping pieces. The zinc of one element should be connected with both carbon plates of the next element, and so on, and the first zinc plate and last to carbon plates should be connected with the motor. The plates thus prepared are to be plunged into the bichromate solution, which is contained in glass or porcelain vessels. The solution is made in the following way: Dissolve bichromate of potash, 1; sulphuric acid, 3; water, 6·6. To charge a gallon of water, according to M. Trouve's method, dissolve in it 24 oz. (1½ lb.) of bichromate of potash, and then add slowly, 72 oz. (9 lb.) of sulphuric acid, bearing in mind that 8 fl. oz. equal 1 lb., not 16, as in dry measure.

poisonous and corrosive. The elements of the battery should remain plunged only when the battery is in use.

Trouve's Solution for Bichromate Batteries.—The proportional parts by weight are: Bichromate of potash, 1; sulphuric acid, 3; water, 6·6. To charge a gallon of water, according to M. Trouve's method, dissolve in it 24 oz. (1½ lb.) of bichromate of potash, and then add slowly, 72 oz. (9 lb.) of sulphuric acid, bearing in mind that 8 fl. oz. equal 1 lb., not 16, as in dry measure.

Carbons, to Cut.—Carbons can be cut with a handsaw moistened with water. Also by scratching deeply and breaking on the scratch.

Plastic Carbon for Batteries.—Max Nitsche-Niesky recommends the following in *Neueste Erfindung:* Good coke is ground and mixed with coal tar to a stiff dough and pressed into moulds made of iron and brass. After drying for a few days in a closed place, it is heated in a furnace where it is protected from the direct flames and burned, feebly at first, then strongly, the fire being gradually raised to white heat, which is maintained for six or eight hours. The fire is then permitted to slowly go down, and when perfectly cold the carbon is taken out of the furnace.

A Home-made Daniell.—The following method of constructing a voltaic couple, or a home-made Daniell cell, may be of interest to the student: Select a small, round earthenware jar, such as is used for keeping preserves, and having lined the bottom with gutta percha, or some suitable cement, to the depth of ¼ in., fix upright in this a rod of zinc, of equal height with the jar, to which a length of copper wire has been attached by passing it through a hole drilled in the upper part of the zinc rod, or by soldering. Make a cylinder of pipe clay, or other porous clay, larger than the zinc rod, and having dried it, make it hot in the fire by degrees, till it attains a red heat. Let this cylinder cool gently, and when cold place it in the jar round the center rod, encircling it a little distance. By moderately heating the end of the cylinder it will, when placed on the gutta percha, make a groove which will fix the tube, and prevent infiltration of the fluids. Line-

Cell.	Element.		Charge.		Work.
	Positive.	Negative.	Porous Jar.	Outer Jar.	
Smee.	Zinc.	Platinized silver.	None used.	Sulphuric acid and water.	Constant current. Electro-deposition of copper, silver, gold.
Chloride of silver.	"	Silver chloride on silver foil.	" "	Weak solution of sal ammoniac.	Constant powerful current. Good for intermittent work, bells, and testing.
Bichromate of potash.	"	Carbon.	" "	Bichromate of potash solution and sulphuric acid.	Powerful occasional current. For experiments, induction coils. With chromic acid, constant.
Leclanche.	"	Carbon and oxide of manganese.	Contains negative element.	Solution of sal ammoniac.	Open circuit. Bells, telegraphs, signaling telephones.
Daniell.	"	Copper.	Sulphuric acid and water.	Saturated solution of copper sulphate.	Closed circuit. Bells, telegraphs, signaling, gilding, plating, electric clocks.
Gravity.	"	"	None used.	Saturated solution of copper sulphate.	Closed circuit. Bells, telegraphs, signaling, gilding, plating, electric clocks.
Grove.	"	Platinum foil.	Strongest nitric acid.	Sulphuric acid and water.	Powerful constant current. Induction coils, electric lighting, medical coils, motors, magnets.
Bunsen.	"	Carbon.	" " "	Sulphuric acid and water.	Powerful constant current. Induction coils, electric lighting, medical coils, motors, magnets.
Fuller.	"	"	Sulphuric acid and water, or water only.	Bichromate of potash solution, or strong bichromate solution and sulphuric acid.	Powerful constant current. Electric lighting or other sustained work.
Granule carbon.	"	"	Sal ammoniac, muriatic acid, and water.	Saturated bichromate solution and muriatic acid.	Powerful constant current. Electric lighting or other sustained work.
Chromate of lime.	"	"	Chromate of lime, sulphuric acid, and warm water.	Sulphuric acid and water.	Powerful constant current. Electric lighting or other sustained work.
Salt water.	"	"	Sulphuric acid and water.	Weak solution of common salt.	Weak constant current. Electric bells and gilding.

the inside of the jar with a plate of thin copper bent into cylindrical form and having a few holes punched in it, through which may be threaded the extremity of another length of copper wire. On the top of this cylinder place a flat ring of copper pierced with holes, and nearly, but not quite, touching the porous cylinder. This forms the battery. To charge it, the *Electrician* gives a saturated solution of sulphate of copper poured between the copper and the clay tube, and some crystals of the same salt are placed upon the perforated ring, so as just to be in contact with the solution. The zinc compartment is then to be filled with a solution of sulphate of zinc, sal ammoniac, or common salt.

Dry.—A good effect can be obtained from a paste of plaster of Paris 1 lb.; oxide of zinc, ¼ lb.; saturated solution of chloride of zinc, enough to make a thick paste. They are very good for medical coils.

Filling for Dry Batteries.—Charcoal, 3 parts; mineral carbon or graphite, 1 part; peroxide of manganese, 3 parts; lime hydrate, 1 part; white arsenic (oxide), 1 part; and a mixture of glucose and dextrine or starch, 1 part; all by weight. These are intimately mixed dry and then worked into a paste of proper consistency with a fluid solution composed of equal parts of a saturated solution of chloride of ammonium and chloride of sodium in water, to which is added 1-10 volume of a solution of bichloride mercury and an equal volume of hydrochloric acid. The fluid is added gradually and the mass well worked up.

To Make a Leclanche Battery.—Place in a porous cell a rod or plate of carbon, and fill the cell with coarsely powdered black oxide of manganese and clean coke or retort carbon. Seal the top, leaving two holes for the air to escape when the cell is set up. This cement, for the top, may be made of black pitch. Place the porous cell in any old jar of the same height containing a saturated solution of sal ammoniac and a rod of zinc.

Agglomerate Leclanches.—MM. Bender and Francken give the following recipe for making agglomerate Leclanche cells: Manganese peroxide, 44%; graphite, 4%; gas tar, 9%; sulphur, 0·6; water, 6·4. These substances, says the *Revue Scientifique*, are reduced to a fine powder—gas tar and water apparently included—they are then carefully mixed, placed in a mould, and strongly compressed. The mixture is then gradually raised to a temperature of 350° C., which not only evaporates the water but also drives off the volatile elements of the gas tar. This result is aided by the presence of the sulphur. A portion of the sulphur combines with the gases derived from the tar and disappears, while the remainder is said to combine with the solid ingredients, producing an unassailable compound, by a transformation analogous to that of the vulcanization of India rubber.

Battery Pomade, for checking the creeping of solutions in cells; paraffine wax, 2 parts; vaseline, 1 part; melted together. Egyptian asphalt is good.

Salt.—To prepare battery salt for Grenet batteries: It may be prepared by triturating together in a dry atmosphere: potassium dichromate, about 4 lb.; sulphuric acid, sp. gr. 1·8, about 1 lb. The dichromate should be perfectly dry, and the acid may, with advantage, be warm. The mixture should be kept from the air in glass, to preserve it in the dry state, as it is very hygroscopic. Its oxidizing action is so strong that it very quickly destroys organic matters by contact at ordinary temperatures.

Battery Solution.—Bottone's battery solution consists of chromic acid 6 parts, water 20 parts, chlorate of potash ½ part, and sulphuric acid 3½ parts by weight. There is no danger, provided the chlorate of potash be dissolved before the sulphuric acid is added. The addition of chlorate of potash to sodium bichromate gives it greater staying powers; but not so markedly as in the case of chromic acid, unless, indeed, a large excess of sulphuric acid is used to neutralize both the sodium and potassium.

Baudoin's Alloy. See **Alloys.**

Bauxite.—A hydrated aluminous ferric oxide. It contains about 60% of alumina, 20% of ferric oxide, 15 to 20 % of water, and from 1 to 3% of silica. It is a highly refractory body, and is used in the manufacture of bauxite bricks.

Beale's Cement. See **Cements.**

Bearings, Brasses for. See **Alloys.**

Bear's Grease. See **Pomades** (*Oils*).

Beaumontague or Bomontague.—This term is applied in the shops to any compound employed for the filling up of holes for purposes of concealment.

Beauty. See **Cosmetics** and the **Skin.**

Beef, to Corn.—There are many recipes. We give one. To each gallon of water add 1½ lb. salt, ½ lb. sugar, ½ oz. saltpeter, and ½ oz. potash. Boil, skim, and when cold pour over the meat.

Beef Tea.—*Bouillon, for Dispensing.*—Concentrated extract of beef, 12 oz.; table salt, 3 oz.; essence or tincture of celery, 1½ oz. or 3 oz. respectively; powdered arrow-root, 1½ oz.; essence of orange or lemon, 1½ oz.; hot water, 3 qts.; if desired about 1½ dr. of tincture of capsicum may be added. Dissolve the extract of beef, arrow-root and salt in hot water; the other ingredients may then be added. Only a small quantity should be prepared at a time.

Beef, Iron and Wine.—Liebig's extract of beef ½ oz. av., ammonio-citrate of iron 256 gr., spirit of orange ½ fl. oz., distilled water 1½ fl. oz., sherry wine sufficient to make 16 fl. oz. Dissolve the ammonio-citrate of iron in the water, dissolve the extract of beef in the sherry wine, add the spirit of orange and mix the solutions.

Beef, Iron and Wine for Soda Fountains.—Beef, iron and wine, 1 oz.; vanilla sirup, 3 oz.

For Dispensing.—For 2 qts.: concentrated extract of beef, 2 oz.; pyrophosphate iron, ½ gr. (dissolve in ½ pt. boiling water). Add tincture curacoa, 2 oz.; tincture orange peel, 2 oz.; sirup, 12½ oz.; alcohol, 12½ oz.; solution citrate of ammonia, 2 oz.; sherry wine, 23 oz.

Beers.—*Ginger Beer.*—1. Jamaica ginger, 2½ oz.; moist sugar, 3 lb.; cream tartar, 1 oz.; juice and peel of 2 lemons; brandy, ½ pint; good ale yeast, ¼ pt.; water, 3½ gal. This will produce 4½ doz. bottles of excellent ginger beer, which will keep twelve months. Boil the ginger and sugar for 20 minutes in the water, slice the lemons, and put them and the cream of tartar in a large pan; pour the boiling liquor over them, and stir well; when milk warm, add the yeast; cover and let it remain 2 or 3 days, skimming frequently; strain through a cloth into a cask, and add the brandy. Bung down very close; at the end of two weeks, draw off and bottle, cork very tightly. If it does not work well, add a very little more yeast.

2. Brown sugar, 2 lb.; boiling water, 2 gal.; cream of tartar, 1 oz.; bruised ginger root, 2 oz. Infuse the ginger in the boiling water, add your sugar and cream of tartar; when lukewarm strain; then add half pint good yeast. Let it stand all night, then bottle; if you desire, you can add one lemon and the white of an egg to fine it.

3. *English Ginger Beer.*—3 gal. water, 6 oz. pulverized ginger; 4 lb. sugar; 4 oz. cream tartar. Boil, and when cold add 2 tablespoonfuls of yeast. Allow it to stand over night, then filter and bottle.

4. *Ginger Beer Powder.*—Jamaica ginger, powdered, 1 oz.; sodium bicarbonate, 7 oz.; sugar, 1¾ lb.; 1 fl. dr. oil of lemon. Make into powders.

5. *Ginger Beer Powders.*—The London *Chemist and Druggist* says that a powder may be prepared thus: ginger, bruised, ½ oz.; cream of tartar, ¾ oz.; essence of lemon, 4 drops. Mix. Some sugar may be added if it be thought desirable to make the packet look bigger. For use this powder is to be added to a gallon of boiling water, in which dissolve 1 lb. of lump sugar, and when the mixture is nearly cool two or three tablespoonfuls of yeast are to be added. The mixture should be set aside to work for four days, when it may be strained and bottled.

Hop Beer.—Water, 5 quarts; hops, 6 oz. Boil three hours, strain the liquor, add water, 5 quarts; bruised ginger, 4 oz.; and boil a little longer, strain, and add 4 lb. of sugar; and when milk warm, 1 pint of yeast. Let it ferment; in 24 hours it is ready for bottling.

Lemon Beer.—1. Boiling water, 1 gal.; lemon, sliced, 1; bruised ginger, 1 oz.; yeast, 1 teacupful; sugar, 1 lb. Let it stand 12 to 20 hours, and it is ready to be bottled.

2. Put in a keg 1 gal. of water; 1 sliced lemon; 1 tablespoon ginger; 1 pt. sirup; ½ pt. yeast. Ready for use in 24 hours. If bottled, tie down the corks.

Maple.—1. To 4 gal. of boiling water add 1 qt. of maple sirup, ½ oz. of essence of spruce; add 1 pt. of yeast, and proceed as with ginger pop.

2. To 4 gal. of boiling water, add 1 qt. of maple sirup, ½ oz. of essence of spruce, and 1 pt. of yeast. Let it ferment for 24 hours, and then strain and bottle it. In a week or more it will be ready for use.

3. Boiling water, 6 gal.; maple sirup, 1½ qt.; essence of spruce, ¾ oz.; add 1½ pt. yeast.

Molasses Beer.—Take 14 lb. molasses; 1¼ lb. hops; 36 gal. water; 1 lb. yeast. Boil the hops in the water, add the molasses and ferment.

Ottawa Beer.—Sassafras, allspice, yellow dock, wintergreen, 1 oz. each; wild cherry bark and coriander, ½ oz.; hops, ¼ oz.; molasses, 3 qt. Put boiling water on the ingredients, and let them stand 24 hours. Filter, and add ½ pt. of brewer's yeast. Leave again 24 hours, then put it in an ice cooler, and it is ready for use. It is a wholesome drink, if it is used in moderation.

Peruvian Beer, Carbonated.—To ½ gal. of sirup add 1 oz. of extract of cinchona or Peruvian bark. This may be flavored with 1 oz. essence sarsaparilla or root beer.

Root Beer.—1. To 5 gal. of boiling water add 1½ gal. of molasses. Allow it to stand for 3 hours, then add bruised sassafras bark, wintergreen bark, sarsaparilla root, of each ¼ lb., and ½ pt. of fresh yeast, water enough to make 15 to 17 gal. After this has fermented for 12 hours it can be drawn off and bottled.

2. Pour boiling water on 2½ oz. sassafras; 1½ oz. wild cherry bark; 2½ oz. allspice; 2½ oz. wintergreen bark; ½ oz. hops; ½ oz. coriander seed; 2 gal. molasses. Let the mixture stand 1 day. Strain, add 1 pt. yeast, enough water to make 15 gal. This beer may be bottled the following day.

3. Sarsaparilla, 1 lb; spice wood, ¼ lb.; guaiacum chips, ½ lb.; birch bark, ½ lb.; ginger, ¼ oz.; sassafras, 2 oz.; prickly ash bark, ¼ oz.; hops, ½ oz. Boil for 12 hours over a moderate fire with sufficient water, so that the remainder shall measure 3 gal., to which add tincture of ginger, 4 oz.; oil of wintergreen, ½ oz.; alcohol, 1 pt. This prevents fermentation. To make root beer, take of this decoction, 1 qt.; molasses, 8 oz.; water, 2½ gal.; yeast, 4 oz. This will soon ferment and produce a good, drinkable beverage. The root beer should be mixed, in warm weather, the evening before it is used, and can be kept for use either bottled or drawn by a common beer pump. Most people prefer a small addition of wild cherry bitters or hot drops to the above beer.

Spruce Beer.—1. Hops, 2 oz.; chip sassafras, 2 oz.; water, 10 gal. Boil half an hour, strain, add brown sugar, 7 lb.; essence of spruce, 1 oz.; essence of ginger, 1 oz.; ground pimento, ½ oz. Put in a cask and cool, add 1½ pt. of yeast, let it stand 24 hours, fine, draw it off to bottle.

2. Hops, 8 oz.; chip sassafras, 2 oz.; water, 10 gal. Boil half an hour, strain, and add brown sugar, 7 lb.; essence of spruce, 1 oz.; essence of ginger, 1 oz.; ground pimento, ½ oz. Put into a cask, and cool, add 1½ pt. yeast, let it stand 24 hours, fine, draw it off to bottle.

3. To 6 gal. of water add 1 pt. essence of spruce; 10 oz. of pimento; 10 oz. ginger; 1 lb. hops. After boiling about 10 minutes, add 24 lb. of moist sugar and 22 gal. of warm water. When the ingredients are well mixed, and lukewarm, add 1 qt. yeast. Let it ferment 24 hours. Strain and bottle.

4. Sugar, 1 lb.; essence of spruce, ½ oz.; boiling water, 1 gal.; mix well and when nearly cold add ½ a wineglass of yeast, and the next day bottle.

5. Essence of spruce, ½ pt.; pimento and ginger (bruised), of each, 5 oz.; hops, ½ lb.; water, 3 gal.; boil the whole for 10 minutes, then add of moist sugar, 12 lb.; warm water, 11 gal.; mix well and when lukewarm add 1 pt. of yeast. After the liquor has fermented for about 24 hours, bottle it.

6. Water, 16 gallons; boil half, put the water thus boiled to the reserved cold half, which should be previously put into a barrel or other vessel; then add 16 lb. molasses, with a few spoonfuls of the essence of spruce, stirring the whole together; add half pint of yeast, and keep it in a temperate situation with the bung hole open for two days, or till fermentation subsides; then close it up or bottle it off, and it will be fit to drink in a few days.

White Spruce Beer.—5 lb. loaf sugar are dissolved in 5 gallons of boiling water, then 2 fl. oz. of spruce are added. When almost cold add a gill of yeast. Place in warm place and after 24 hours strain through a piece of flannel and bottle.

Table Beer.—"Table beer of a superior quality may be brewed in the following manner, a process well worth the attention of the gentleman, the mechanic, and the farmer, whereby the beer is altogether prevented from working out of the cask, and the fermentation conducted without any apparent admission of the external air. I have made the scale for one barrel in order to make it more generally useful to the community at large; however, the same proportions will answer for a greater or less quantity, only proportioning the materials and utensils. Take one peck of good malt, ground, 1 lb. of hops, put them in twenty gallons of water, and boil them for half an hour; then run them into a hair cloth bag or sieve, so as to keep back the hops and malt from the wort, which, when cooled down to 60° by Fahrenheit's thermometer, add to it 2 gallons of molasses, with 1 pint, or a little less, of good yeast. Mix these with your wort, and put the whole into a clean barrel, and fill it up with cold water to within six inches of the bung hole (this space is requisite to leave room for fermentation), bung down tight. If brewed for family use, would recommend putting in the cock at the same time, as it will prevent the necessity of disturbing the cask afterward. In one fortnight this beer may be drawn and will be found to improve."—*Eng. Mech.*

Beer Tonic.—Plain sirup, 22° Baume, 5 gals.; oil of wintergreen, 2 dr.; oil of sassafras, 2 dr.; oil of allspice, ½ dr.; oil of sweet orange, 2 dr. Mix the oil with 12 oz. of alcohol and add to the plain sirup. Then add 35 gal. of water at blood heat, and ferment with sufficient yeast. To this add 1 dr. of salicylic acid dissolved in conjunction with 1 dr. of baking soda in a small glass of water. After it has ceased effer-

vescing, add to the fermenting beer. The object of using this minute quantity is to prevent putrefactive fermentation. The natural vinous ferments will not be obstructed by it.—*American Bottler.*

Bees.—1. Bees never attack when their stomachs are filled with honey or other liquid sweet. This is their normal condition when swarming, and therefore they are then harmless and also when returning laden to their hives. 2. Neither do they attack when thoroughly frightened. We frighten bees by blowing smoke among them, or by rapping rather violently on their hives. 3. When bees are alarmed in a hive by smoke or concussion, their first impulse is to fill their honey bags from their combs. 4. Bees in a hive that is constantly being rapped against will in a few minutes rush boldly out from among their combs into any empty skep or box set over them.

Beetles, to Exterminate.—Red lead, sugar and flour, equal parts, mix; sprinkle near the holes.

Beetle Powder.—Powdered borax, 20 parts; precipitated carbonate of baryta, 10 parts. The precipitated carbonate of baryta should be used, and not the native witherite.

Bell Metal. See **Alloys.**

Belting.—A belt should be run with the grain side next the pulleys.

Belting, to Cement. See **Cements.**

To Clean Belts.—If the belting is not brittle or rotten, a thorough wiping off of the excess of oil and scraping the face with a sharp tool to take off the gummy matter, and finally wiping the inside with a little naphtha or gasoline upon a cloth, will generally restore the belt. The pulley should be cleaned also. If the belting has become weak and rotten, it should be thrown away.

Belts, to Lace.—1. The ends of a belt should always be cut off square, not guessed at by the eye, but laid off with a tool. The holes ought to be made with a small punch at a proper distance from the end; the size of the holes and the distances of them depending on the width of the belt. The use of an awl is reprehensible, for the holes are apt to be made irregular by it, and much larger than there is need of. The end of the lace should be tied with a square knot in the middle of the outside, for the corners of the belt where it is cut are most exposed and apt to whip out. Tying a belt lace does not look so neat as where the ends are put through an incision, but tying saves the belt from having extra holes made in it. The laces ought to be of the same thickness from end to end, or as nearly so as possible. It often happens that laces have very thin spots in them; such should be kept for short belts, and never used for long ones. Moreover, the holes must be made at equal distances apart and not too many of them. Every hole weakens the belt, and none that are not absolutely essential should be cut. All new laces, as well as new belts, should be stretched by hanging weights on them before they are used; petroleum, sawdust, resin, and similar substances should never be used. When a belt gets harsh or dry, neat's-foot oil is the best thing to apply to it.

2. Begin on the outside of the belt at the middle, pass one end of the lacing through one end of the belt and bring it out through the corresponding hole of the other end of the belt, laying it diagonally off to the left. Now pass the other end of the lacing through the hole last used, and carry it over the first strand of the lacing on the inside of the belt, passing it through the first hole used, and lay it diagonally off to the right. Now proceed to pass the lacing through the holes of the belt in a zigzag course, leaving all the strands inside the belt parallel with the belt and all the strands outside the belt oblique. Pass the lace twice through the holes nearest the edge of the belt, then return the lace in the reverse order toward the center of the belt, so as to cross all the oblique strands, and make all the inside strands double. Finally pass the end of the lacing through the first hole used, then outward through an awl hole, then hammering it down to cause it to hold. The left side is to be laced in a similar way.

Slipping of Leather Belts.—The slipping of belts is a great annoyance, not always remedied by tightening. 1. When a ready remedy is demanded for a slipping belt, the powder known as whiting, sprinkled sparingly on the inside of the belt, is least harmful of any similar application.

2. Powdered resin is bad, as it soon dries the leather and cracks the belt, while it is difficult to get it out of the leather; whereas whiting may be wiped off or washed out with water.

3. The use of water on belts, preliminary to oiling, is good. The belt should be washed on shutting down at night—or Saturday, after the close of work, is better—and then the oil applied when the belt is partially dry. Never oil or wash a belt while stretched on the pulleys. If iron-faced pulleys were always lagged with leather, there would be little complaint of the slipping of belts. But often this slipping is due to too much strain on the belt; there is economy in running wide belts—wider than is the usual practice. Many a three-inch belt has to do duty for a four-inch belt, to the annoyance of the operator and the ruin of the belt.

4. A piece of rubber belting fastened around the belt pulley of an engine will keep the belt from slipping.

5. Use a piece of beeswax rubbed on the inside of the belt or on the pulleys as a temporary remedy in cases of emergency, though with proper size belts and pulleys, properly put in, there should not ordinarily be any slipping.

Lubricator for Belts.—5 parts of India rubber are cut fine and melted together with 5 parts oil of turpentine in an iron, well covered vessel; then add 4 parts of resin, stir well, melt, and add 4 parts of yellow wax, stirring constantly while melting. This mixture while warm is added, with constant stirring, to a melted mixture of 15 parts fish oil and 5 parts of tallow, and the whole is agitated until it has congealed. The mass is applied to old belts upon both sides in a warm place, and when the belts are in use, from time to time upon the inner side. By this treatment they become very durable.—*Chem. Centralblatt.* See also **Lubrication.**

Which Side to Run.—All the best belt makers say, run grain side to the pulley, and it is claimed that 33⅓ more power can thus be transmitted than with the flesh side next the pulley. The grain of the leather has a velvety surface, which enables it to hug the pulley closer than will the hard flesh side. Some users run the flesh side to the pulley for small belts, and then daub and stick up the belt with beeswax or resin to make it take hold, but this is not economical for the life of a belt, is unworkmanlike, and there is always more or less fussiness in running machinery where the belts are so treated, instead of their running for years without any attention, as they will sometimes do when run grain side to the pulley, and of proper size to transmit the desired power.

To Preserve.—A very little pure lard oil or neat's-foot oil will preserve belts and prevent them from cracking. Castor oil and vaseline are also used.

Belts, Military, to Whiten.—First brush the belt over with a mixture of: Linseed oil, 4 oz.; precipitated oxide of zinc, 1 oz., and dry over a stove at a heat not over 160° Fah. When thoroughly dry, roughen by means of pumice powder and apply another coating. Dry as before, and varnish with amber or copal varnish.

Benedictine. See **Liquors.**

Bengal Lights. See **Pyrotechny.**

Benzine.—An ethereal hydrocarbon, obtained in many ways, principally from the distillation of petroleum. It is very useful in the arts as a solvent and for the removal of grease spots, etc.

To Deodorize Benzine—1. Shake repeatedly with fresh portions of metallic quicksilver. Let it stand for 2 days, then rectify, or shake with plumbate of soda (oxide of lead dissolved in caustic soda), then rectify.

2. Digest litharge in strong solution of soda, and shake the benzine up with this.

3. The *Scientific American* states that the disagreeable odor of benzine can be removed by shaking repeatedly with plumbate of soda, made by dissolving oxide of lead in caustic soda, and rectifying. Simply shaking with charcoal and filtering will partially remove the odor.

Benzoate.—A salt in which one atom of benzoic acid is replaced by a metal or other basic radical.

Benzoic Acid.—A vegetable principle of feebly acid properties, existing in gum benzoin. When pure it forms light and soft white scales of a sweetish acrid taste soluble in 25 parts of hot and about 200 parts of cold water. At a strong heat, it is entirely volatilized, and is deposited on any cold surface.

Benzoin.—The balsamic resin exuded from incisions made in the stem of the *Styrax benzoin*, a native of Sumatra, Borneo, Laos, and Siam. Several varieties of benzoin are in the market, two, however, are chiefly used in medicine, one in agglutinated masses, the other (from Siam) in tears, being the purer, and having the stronger odor. Odor agreeable and somewhat like that of vanilla, but more balsamic. It fuses at a gentle heat.

Benzol, True.—A peculiar ethereal hydrocarbon discovered by Faraday, among the products of the destructive distillation of whale oil and other organic substances (1825); and subsequently shown by Mitscherlich to form the principal ingredient in the distillate procured by the action of heat on a mixture of benzoic acid and hydrate of lime. In 1849, Mr. C. B. Mansfield discovered its presence in coal tar naphtha, from which the benzol of commerce is now chiefly if not wholly obtained.

Berries, Persian.—Known also as French, Avignon, and Turkey berries. These berries are the fruit of Rhamnus infectorus, R. saxatilis, R. amygdalinus, the dyer's buckthorn, small trees which grow in France, Spain, the Mediterranean islands, and Turkey. The quality of the berries differs considerably according to the locality where they are grown. Some of the berries are large and greenish, while others are smaller, brown and wrinkled, the coloring principle in the two kinds being distinct.

Beton. See **Cements.**

Beverages. See **Beers, Liquors and Cordials, Waters,** and **Wines,** etc., and the names of separate drinks, as **Punches, Sherry Cobblers,** etc.

Bounce, Cherry.—To 6 gal. cherry juice add 15 gal. 80 % spirit; 15 gal. Catalonia or Marseilles wine; 1½ oz. essence noyau; ¼ lb. cinnamon, ground and infused in ¼ gal. water; ¼ lb. of cloves, ground, infused in ¼ gal. of water; ¾ oz. of mace infused in ½ pt. 95 % alcohol. Mix all the above ingredients in a clean barrel, and add 30 gal. sugar sirup, 13° Reaumur. Stir up all the ingredients well together, and filter after 4 or 5 days. Make the color a little darker with sugar coloring, and to give a good shade add a little archil.

Champagne a la Minute.—Put into a pitcher or bowl 2 teaspoonfuls of carbonate of soda and about 2 oz. of finely powdered sugar; pour upon these 1 quart of sharp cider, and you have a very pleasant imitation of champagne.

Claret Beverage.—To 1 quart of orangeade add a bottle of claret and freeze as for iced coffee.

Cocoanut Beverage.—To 2 grated cocoanuts with their milk add 2 quarts pure water; place over the fire and boil for 5 or 6 minutes, stirring constantly with a wooden spatula; then strain through a hair sieve. Add to the liquid 12 oz. of pulverized sugar; mix well together and ice. This is a delightfully cooling beverage.

Iced Tea or Coffee.—Make a strong infusion of tea or coffee; fill a pitcher or bowl with broken ice; upon this pour the infusion and sweeten to taste.

Iced Coffee Beverage.—Make 1 quart of strong coffee, to which add 1 pint of simple sirup; mix well and put into a freezer, and freeze just sufficiently to admit of its being poured into glasses for use.

Egg Flip.—Beer, 1 pint; eggs, 3; sugar, 2 oz.; nutmeg and ginger, sufficient. Break the eggs into one-half of the beer; add the sugar, and beat well together; then place it in a clean warmer, and heat it over the fire to nearly the boiling point, stirring it all the time, but do not let it boil; next add the other portion of the beer and the spices, and mix well together. Some persons add a glass of spirits. Care must be taken not to let it boil, as, if it does, the eggs will separate.

Egg Nog.—Take the yelks of 8 eggs, and beat with them 6 large spoonfuls of pulverized loaf sugar; when this is a cream, add the third part of a nutmeg, grated; into this stir one tumblerful of good brandy, and a wineglassful of good Madeira wine; mix them well together; have ready the whites of the eggs beaten to a stiff froth, and beat them into the mixture; when all are well mixed, add three pints of rich milk.

English Rumfustian, Winter or Summer.—Whisk well up the yelks of a dozen eggs, and add them to a quart of strong beer; to this is added a pint of gin. Put into a saucepan half a pound of loafsugar, a grated nutmeg and a stick of cinnamon, and the yellow rind of one lemon. Pour over these a bottle of sherry wine; place upon the fire, and when the wine boils pour it upon the gin and beer; mix well and drink hot, or it may be cooled and iced.

Cooling Fever Drink.—Vinegar, 1 lb.; honey, 2 lb.; water, 6 lb.; mix.

German Beverage.—To 1 pint of orgeat sirup add ½ gill of rum, 1 gill Kirschenwasser, and 1 quart of Seltzer water. Now ice.

Holland Beverage.—Make a rich lemonade or lemon ice, and to every three quarts add 1 pint of the best Holland gin.

Imperial Beverage.—Pare off the yellow rind or zest from 1 fresh lemon; add it to 1 quart of cream. Place upon the fire and bring it to the boiling point, stirring continually; now remove and continue to stir until quite cold. Sweeten with powdered sugar to your taste. Strain the juice of four lemons into china bowl, pour the cream slowly upon the juice, holding the vessel containing it 2 feet above the bowl; stir well together, and let it stand two hours before using it.

Jove's Nectar.—For 3 gallons, peel the yellow rind from 1½ doz. fresh lemons, very thin, and steep the peelings for 48 hours in a gallon of brandy; then add the juice of the lemons, with 5 quarts of water, 3 lb. loaf sugar, and 2 nutmegs, grated; stir it till the sugar is completely dissolved, then pour in 3 quarts of new milk, boiling hot, and let it stand 2 hours, after which run it through a jelly bag till it is fine. This is fit for immediate use, but may be kept for years in bottles, and will be improved by age.

Narranada.—To 4 quarts of rich orangeade add 2 lemons and 2 oranges, cut into thin slices crosswise, and one pint Schiedam schnapps. Mix well and ice.

Orgeat Beverage.—Blanch 1 lb. sweet and 1 oz. bitter almonds; put them into a stone mortar and pound them to a fine paste, with 1 wineglassful of orange flower water; then add and rub in by degrees ½ pt. rose water and 1½ pt. pure water. Strain through a hair sieve and add it to 3 pt. simple sirup; place it upon the fire and boil up for 1 minute, remove and bottle. A tablespoonful of this added to tumbler of ice water, soda, or Seltzer, is a pleasant and refreshing drink.

Soda Negus.—Put 1 pt. port wine, with ¼ lb. white sugar, ½ doz. cloves, ¼ of a nutmeg grated into a saucepan; make it hot, but do not let it boil; pour it into a bowl, and upon the warm wine decant 2 bottles of soda water.

Spanish Beverage.—To ¾ lb. sugar and 6 oz. pounded almonds, as for orgeat, add 1 pt. grape juice and 3 pt. water. Mix well together and filter. It should then be iced.

Spanish Beverage.—To 3 pt. rich lemonade add 1 bottle claret and ½ a nutmeg, grated.

Turkish Beverage.—Put any quantity fresh, ripe grapes, picked from their stalks, into an earthen pan, cover them with boiling water and set in a warm situation for four or five hours to infuse, after which strain off the liquid, sweeten it to your taste, place in a freezing can and half freeze. Grated pineapple prepared as above forms also a delicious beverage.

West India Tipples.—To a tumbler filled two-thirds with lemonade, add a wineglass of brandy and fill to the brim with green lime juice. To a tumbler of punch add a teaspoonful of extract of Jamaica ginger, and a little sirup of fine sugar. To a tumbler of ice cold water add the juice of three ripe limes, and sweeten to your taste. These are very refreshing and healthful beverages for the hot season.

Bibra's Metal. See **Alloys.**

Brickwork, Efflorescence on.—This white coating which is such a disfigurement can usually be prevented by adding oil to the mortar at the rate of 1 gal. to the cask of lime. Linseed oil or any oil not saline will do. If cement is used, an extra gallon of oil must be used. When incrustrations are once formed, nothing can be done except to wash with dilute hydrochloric acid.

Bicycles, Enamel for. See **Enameling.**

Bicycle Tires, Cement for. See **Cements.**

Bicycle Tires, to Mend.—Use rubber cement (see **Cements**). Use no more than is necessary, and tie with cord. Do not disturb for twelve hours.

Bidery. See **Alloys.**

Bilberry Wine. See **Wines.**

Billiard Balls, to Color. See **Dyeing.**

Bird Cages, to Paint. See **Paints.**

Birdlime.—*Prep.* Boil the middle bark of the holly, gathered in June or July, for 6 or 8 hours in water, until it becomes tender; then drain off the water, and place it in a pit under ground, in layers with fern, and surround it with stones. Leave it to ferment for two or three weeks, until it forms a sort of mucilage, which must be pounded in a mortar, into a mass, and well rubbed between the hands, in running water, until all the refuse is worked out; then place it in an earthen vessel, and leave it for four or five days to ferment and purify itself. Remarks: Birdlime may also be made from mistletoe berries, the bark of the wayfaring tree and other vegetables, by a similar process. Should any of it stick to the hands, it may be removed by means of a little oil of lemon bottoms, or turpentine. *Use.* To rub over twigs to catch birds or small animals. It is said to be discutient when applied externally.

Birds, Mocking, Food for.—6 parts corn meal, 6 parts pea meal, and 3 parts moss meal (which is dried, ground German moss seed). Add a very little lard, melted, and molasses to sweeten. This preparation is put in a covered jar, after having been fried for half an hour, being stirred all the time it cooks. This will keep for a length of time.

Birds, Singing, German Paste for Feeding.—Blanched sweet almonds, 1½ lb.; pea meal 3 lb.; butter, 4½ oz.; a few grains saffron; honey q. s. Form into a paste, and granulate by passing through a colander. The yelks of 2 eggs may be added.

Bird Skins, to Preserve.—Make an incision from the breastbone to the vent; with a small piece of wood work the skin from the flesh. When the leg is reached, cut through the knee joint and clear the shank as far as possible, then wind a bit of cotton wool on which some arsenical soap has been put round the bone; do the same with the other leg. Now divide spine from root of tail, taking care not to cut too near the tail feathers, or they will come out. Next skin the wings as far as possible and cut off. The skin will now be entirely clear of the body. The skin must now be turned inside out and the neck and skin gently pulled in opposite directions till the eyeballs are fully exposed. The whole of the back of the head may be cut off and the eyes and brains taken out and their places filled with cotton wool. The whole skin should be rubbed well with arsenical soap or plain arsenic, and the neck returned to its natural position, when, after filling the body with a little dry grass or wool, the job is done. It is very easy, and the skin of a bird is much tougher than one would suppose, though, of course, they vary, the night-jar being very thin, while humming birds are fairly tough. All the apparatus required is a sharp knife and a pair of scissors, or, for large birds, a strong pair of nippers to divide the bones.

Biscuit.—Term applied to ware before it has been glazed.

Bishop.—To two bottles of claret add a quarter of a pound of loaf sugar, the thin yellow rind of an orange, and six cloves; make all hot, but do not allow it to boil; then strain it through a hair sieve into a bowl and ice.

Heidelberg Bishop.—To a bottle of red Rhine wine add 2 oz. of lump sugar, the thin yellow rind of a lemon, a small stick of cinnamon, and half a dozen of coriander seeds and wineglassful of Kirschenwasser; warm all without boiling and strain; ice.

Bishop, to Make.—Procure a large, ripe, sound lemon; pierce the same in various parts, and rub into the peel as much pounded white loaf sugar as will abstract a sufficiency of the essential spirit of the rind into it. Introduce into each puncture a spice clove, and lay the lemon in a bowl. Have ready at hand, on the side of the fire, a quart of the best port wine, scalding hot; pour the same into the bowl, over the lemon, adding sugar to your taste, and crown the bowl with the whites of half a dozen eggs, whipped up into a consistent froth.

Bismuth Bronze. See **Alloys.**

Bismuth, Purification of.—M. E. Smith adds to 16 parts of bismuth, kept in fusion at the lowest possible temperature, 1 part of a mixture of 8 parts of cyanide of potassium and 3 parts flowers of sulphur. After fifteen minutes the metal is allowed to cool. Do not inhale the fumes.

Bismuth Solder. See **Soldering.**

Bites and Stings will generally be remedied by a paste composed of equal parts of subnitrate of bismuth and glycerine. *Treatment.*—If the part bitten shows any tendency to become inflamed, rub into it dilute carbolic acid—strength 1 part in 20. A piece of lint soaked in the same should be placed over it, covered with oiled silk, and secured by strapping. At the same time internal tonics will be required, and the bowels must be rendered

active. The carbolic acid treatment is antiseptic. The acid being absorbed kills the germs and bacteria, and so prevents putrefaction; but it does not of necessity allay inflammation, since the mechanism of the latter having been set going, it may depend on causes other than the presence in the blood of septic material. If the inflammation appears to increase, the best method of treatment will be to take of bread crumbs so much as suffices to make a poultice for the part; then take a known quantity of hot water, and add to it one-twentieth of its volume of strong carbolic acid; to this add 1 drm. of tincture of opium; and with this liquid make the poultice.

Wasp and Bee Stings.—Examine the part with a lens, and the sting will probably be found. Remove it with tweezers. Rub in some dilute ammonia—1 part of dilute liquor ammoniæ to 3 parts of water—and then apply ice. If ammonia is not at hand, chalk or carbonate of soda may be used, or any alkali. If ice cannot be had, a piece of lead, marble, or stone may be used.

Bitters.—Bitters are considered as tonic and stomachic, and to improve the appetite when taken in moderation. The best time is early in the morning, or an hour before meals. An excessive use of bitters tends to weaken the stomach. They should not be taken for a longer period than a fortnight at one time, allowing a similar period to elapse before again having recourse to them.

Angostura.—4 oz. gentian root; 10 oz. each calisaya bark, Canada snake root, Virginia snake root, licorice root, yellow bark, allspice, dandelion root, and Angostura bark; 6 oz. cardamom seeds; 4 oz. each balsam of tolu, orangetis, Turkey rhubarb, and galanga; 1 lb. orange peel; 1 lb. alkanet root; 1½ oz. caraway seed; 1½ oz. cinnamon; ½ oz. cloves; 2 oz. each nutmegs, coriander seed, catechu and wormwood; 1 oz. mace; 1¼ lb. red sanders wood and 8 oz. turmeric. Pound these ingredients and steep them for fifteen days in 50 gal. proof spirit; before filtering, add 30 lb. honey.

Aromatic. — Macerate 2¾ lb. ground dried small orange apples; ¼ lb. ground dried orange peel; 2 oz. ground dried calamus root; 2 oz. ground dried pimpinella root; 1 oz. ground dried cut hops, for fourteen days, with 10 gal. of spirit at 45%; press, and add 2½ pt. brown sugar sirup. Filter. Color dark brown.

Berlin Bitters.—Dissolve in 3 qt. 80% alcohol Tr., 40 drops oil of juniper, 40 drops oil of coriander, 20 drops oil of angelica, 20 drops badian seed oil, 22 drops oil of ginger; add 3 qt. of water and ½ lb. of sugar to this solution. Filter and color brown.

Boker's.—1½ oz. quassia; 1½ oz. calamus; 1½ oz. catechu, powdered; 1 oz. cardamom; 2 oz. dried orange peel. Macerate for ten days in ½ gal. strong whisky, and then filter and add 2 gal. water. Color with mallow or malva flowers.

Brandy.—Grind to coarse powder 3 lb. gentian root, 2 lb. dry orange peel, 1 lb. cardamom seeds, 2 oz. cinnamon, 2 oz. cochineal. Infuse ten days in 1 gal. brandy, 8 gal. water, and filter.

Hamburg.—Grind to a coarse powder 2 oz. aguric, 5 oz. cinnamon, 4 oz. cassia buds, ½ oz. grains of paradise, 3 oz. quassia wood, ¾ oz. cardamom seeds, 3 oz. gentian root, 3 oz. orange apples dried, 1½ oz. orange peel. Macerate with 4¼ gal. 95% alcohol, mixed with 5¾ gal. water; add 2¾ oz. acetic ether. Color, brown.

Hostetter's.—The following is given as the composition of Hostetter's bitters: Calamus root, 2 lb.; orange peel, 2 lb.; Peruvian bark, 2 lb.; gentian root, 2 lb.; Colombo root, 2 lb.; rhubarb, 8 oz.; cinnamon, 4 oz.; cloves, 2 oz.; diluted alcohol, 4 gal.; water, 2 gal.; sugar, 2 lb.

Orange. — Macerate 6 lb. orange peel for twenty-four hours with 1 gal. water, cut the yellow part of the peel from off the white, and chop it fine; macerate with 4¾ gal. 95% alcohol for two weeks, or displace; then add a sirup made of 4¼ gal. water and 16 lb. sugar. Filter through Canton flannel.

Peruvian. — 8 oz. red Peruvian bark; 8 oz. orange peel, 1½ dr. each cinnamon, cloves and nutmeg, and 75 cayenne pepper seeds. Infuse them, well bruised, in 8 gal. proof spirit, for fifteen to twenty days, stirring every day. Draw off and filter.

Spanish.—Grind to coarse powder 5 oz. polypody, 6 oz. calamus root, 8 oz. orris root, 2½ oz. coriander seed, 1 oz. centaurium, 3 oz. orange peel, 2 oz. German chamomile flowers; then macerate with 4¾ gal. 95% alcohol, and add 5¼ gal. water and 1½ oz. sugar. Filter and color brown.

Stomach.—Grind to a coarse powder ½ lb. cardamom seeds, ½ lb. nutmegs, ¼ lb. grains of paradise, ½ lb. cinnamon, ¼ lb. cloves, ¼ lb. ginger, ¼ lb. galanga, ¼ lb. orange peel, ⅛ lb. lemon peel; then macerate with 4¾ gal. 95% alcohol, and add a sirup made of 4½ gal. water and 12 lb. sugar; filter.

Wild Cherry.—Wild cherry bark, 4 lb.; squaw vine (partridge berry), 1 lb.; juniper berries, 8 oz. Pour boiling water over, and let stand for twenty-four hours; strain, and again pour boiling water on the ingredients; let macerate for twelve hours, then express and filter through paper, so that the whole will make 5 gal., to which add 3½ lb. of sugar, 1½ gal. molasses, 6 oz. tincture of peach kernels, 3 oz. tincture of prickly ash berries, 2 qt. alcohol.

Wine.—1. Bruised gentian root, fresh orange and lemon peel, of each 1¼ oz.; white wine, 1 qt.; digest for a week, and strain.

2. Cinchona bark bruised, 8 oz.; white canella, 1½ oz.; juniper berries, lemon peel, and winter's bark, of each 1¼ oz.; carbonate of soda, ¾ oz.; Madeira wine, 1¾ gal.; digest for a week.

3. French lemon peel, 1 lb.; dried orange peel, ½ lb.; bruised gentian root, ¼ lb.; Cape wine, 1 gal.; as before.

Bitumen.—A name given to several of the hydrocarbons.

Black Ash.—Crude soda, ball soda. This is the first crude result of the decomposition of salt cake, containing, besides caustic and carbonated soda, lime, oxide of iron, carbon, etc. It was at one time employed by bleachers to a large extent, but is now abandoned. It forms large blocks of a dark color, and is very readily soluble, leaving, however, a quantity of insoluble impurities. The name is sometimes wrongly given to alkali waste.

Blackboards, Paint for. See **Paints.**

Black Flory.—Dried scum of the dyer's wood bath. A superior blue black.

Blackings, Polishes, and Waterproof Compositions, Harness.—1. Properties of a good blacking are: That it makes the leather both soft and flexible and that it shines or polishes with slight friction. It is not manufactured as the ordinary boot and shoe blackings are, but where animal charcoal is used this substance is very often best prepared before use, so that the phosphate of lime may be removed, which otherwise would give an inferior blacking, and present a grayish tinge instead of a black one. It is therefore advisable to treat the bone black; 20 parts of it may be taken and treated with 6 parts of pure hydrochloric acid, it is then allowed to stand for twenty-four hours, and 100 parts of boiling water added and allowed to settle. Draw off the liquid and then treat the sediment with five parts of pure concentrated sulphuric acid; again stand by for twenty-four hours, add another 100 parts of boiling water and draw off. When the sediment is deposited this residue is then nearly pure and free from acid, and is capable of producing a good blacking of a deep color. Other blacks that are frequently used are Frankfort black and lamp black, which do not require the above treatment. Berlin blue which has been freshly precipitated also gives a most beautiful

color of a metallic luster, but is more expensive. Every blacking must also contain a substance which will cause it to adhere to the leather, so that the color may become fixed. This is attained by the addition of a mixture of 2 parts of molasses and 1 part of glycerine; where glycerine is not used other substances take its place, to render the leather soft. This is accomplished by using one of the following oils, which are of a non-drying character: olive, sesame, lard, fish, seal, sperm; but good cod liver oil of the curriers answers better than all: white of egg, isinglass and flour are injurious, as they grow mouldy and will not keep, as well as producing cracking. Resin oil should also be avoided as unfit for blacking. The following are some receipts for the preparation of various blackings, etc.

2. Harness polish is made by breaking 4 oz. of glue in pieces and pouring over it 1 pint of vinegar. This is allowed to remain until perfectly soft, then make another solution of 2 oz. of gum arabic and half a pint of black ink; to mix add another half pint of vinegar to the glue solution over a moderate fire, but do not let it boil. When it is dissolved add the gum solution, keep at a temperature of 180° F., and further add 2 drm. of isinglass in a little water, then remove from the fire and draw off for use. It is to be applied by a sponge, and a very thin coat given, allowing to dry quick, which gives a better polish.

3. Harness blacking is made by melting 2 oz. of mutton suet and 6 oz. of beeswax together, add 6 oz. of sugar candy, 2 oz. of soft soap, 2½ oz. of lampblack, ½ oz. of powdered indigo, and when thoroughly mixed add ¼ pint oil of turpentine.

4. Waterproof harness paste is made by putting into a glazed vessel 2 oz. of black resin, which is melted over a fire. When dissolved add 3 oz. of beeswax, and when this is melted remove from the fire, then add ½ oz. of fine lampblack, ½ drm. of Prussian blue in powder. These are stirred well together, and enough turpentine is added to form into a thin paste. Allow to cool, apply with a sponge, and finally polish with a soft brush.

5. Another blacking is made by taking ¼ oz. of isinglass, ¼ oz. of fine powdered indigo, 4 oz. of soft soap, 5 oz. of glue, 4 oz. of logwood, 2 pt. of vinegar, ½ oz. of ground animal charcoal, and 1 oz. of beeswax. The color of the logwood is to be extracted by putting it into the vinegar and applying a gentle heat, then strain it and add the other ingredients, boil till perfect solution takes place, and store up in glass or stoneware jars. This is very useful for army harness.

6. A good blacking for a working harness, which is to be applied with a sponge and polished with a brush, is prepared as follows, and should be applied at least once a week. Melt 4 oz. of mutton suet with 12 oz. of beeswax, then add 12 oz. of sugar candy, 4 oz. of soft soap dissolved in water, and 2 oz. of fine powdered indigo. This, when well mixed, is thinned out with ½ pt. of turpentine.

7. Blacking for harness. Molasses 8 oz., lamp black 1 oz., 1 teaspoonful of yeast, sugar candy 1 oz., olive oil 1 oz., gum tragacanth 1 oz., and 1 oz. of isinglass. To this is added a cow's gall, then mix with 2 pt. of stale beer, and stand by the fire for one hour.

8. Another polish for carriage harness, which must not be applied too frequently, as it is liable to crack the leather, is made from 3 sticks of black sealing wax, dissolved in ½ pt. of alcohol, and applied with a sponge, or a similar one may be made by dissolving lac in alcohol, and coloring black with lamp black.

9. Harness that has become soiled can be restored by the use of the following French blacking: 4½ lb. of stearine, 6¾ lb. of turpentine, 3 oz. of animal charcoal. It is prepared by beating the stearine into thin sheets, then mixing with the turpentine, and heating in a water bath during continual stirring, then the charcoal is added and the whole placed in another vessel and stirred so as to prevent its crystallizing. It must be warmed when using and rubbed on with a cloth as quickly as possible, giving it a very thin coat, and when nearly dry polish with a silk cloth.

10. Another blacking: Molasses 8 parts, lamp black 1 part, sweet oil 1 part, gum arabic 1 part, isinglass 1 part, water 32 parts. Melt all together, and when cold add 1 oz. spirits of wine, apply with a sponge, and if required, warm it before use by placing in hot water.

11. Glue or gelatine 4 oz., gum arabic 3 oz., water ¾ pint. Dissolve by heat, and add of molasses 7 oz., finely powdered animal charcoal 5 oz., and then gently evaporate until the compound is of the proper consistence when cold, stirring all the time. It must be kept corked.

12. Beeswax 1 lb., animal charcoal ¼ lb., Prussian blue 1 oz., ground in linseed oil 2 oz., oil of turpentine 3 oz., copal varnish 1 oz. Mix them well, and form the mass into cakes while it is still warm.

13. Add to No. 12, while still warm, soft soap 4 oz., oil of turpentine 6 oz.; put into pots or tins while warm.

14. A good blacking consists of hog's lard 4 oz., neatsfoot oil 16 oz., yellow wax 4 oz., animal charcoal 20 oz., brown sugar 16 oz., water 16 oz. Heat the whole to boiling, then stir it until it becomes cool enough for handling, and roll it into balls about 2 in. in diameter.

15. Soften 2 lb. glue in 1 pt. water; dissolve 2 lb. soap (Castile is the best, but dearest) in 1 pt. warm water; after the glue has become thoroughly soaked, cook it in a glue pot, and then turn it into a larger pot; place this over a strong fire, and pour in the soap water, slowly stirring till all is well mixed; then add ½ lb. yellow wax cut into slices; let the mass boil till the wax melts, then add ½ pt. neatsfoot oil and sufficient lampblack to impart a color; let it boil a few minutes, and it will be fit for use.

16. 2 oz. shellac, 3 pt. alcohol, 14½ pt. fish oil, 19 pt. West Virginia oil, 1 lb. lampblack, 1 pt. spirits of turpentine, 9 pt. coal oil; the first two are combined, then the third is added, and all the others are well mixed.

17. English ball blacking for harness is made from 1 oz. of lard, 1 oz. of beeswax, 8 oz. of ivory black, 8 oz. of sugar, 4 oz. of linseed oil, and 2 or 3 oz. of water; or it may be composed of 8 oz. of beeswax, 4 oz. of ivory black, 2 oz. of Prussian blue, 2 oz. of spirits of turpentine, and 1 oz. of copal varnish. Melt the wax and stir in the other ingredients, and when cold roll into balls and use as required.—*Harness.*

18. Heat together over a slow fire, 2 oz. white wax and 3 oz. turpentine; when the wax is dissolved, add 1 oz. ivory black and 1 dr. indigo, thoroughly pulverized and mixed; stir the mixture until cold. Apply with a cloth, and polish with a shoe brush.

19. An excellent oil for farm and team harness is made of beef tallow and neatsfoot oil as follows: Melt 3 lb. pure tallow, but do not heat it up to a boil; then pour in gradually 1 lb. neatsfoot oil, and stir until the mass is cold; if properly stirred, the two articles will become thoroughly amalgamated, and the grease will be smooth and soft; if not well stirred, the tallow will granulate and show fine white specks when cold. The addition of a little bone-black will improve this oil for general use.

20. Melt together 8 oz. beef suet, 2 oz. neatsfoot oil, 2 oz. white wax, and 2 oz. pulverized gum arabic; add 1 gill of turpentine, and sufficient bone-black to give the whole a good color; stir until thoroughly mixed, remove from the fire, continue to stir until cold, then roll into balls. To apply, warm the ball, rub it on the leather, and polish with a woolen cloth.

21. Another kind is made of 2 oz. hog's lard, 8 oz. best neatsfoot oil, 2 oz. beeswax, 10 oz. ivory black, and 8 oz. water. Heat the whole to a boil, remove from the fire, stir until suffi-

ciently cool, and form into balls about 2 in. in diameter.

22. A third description is made of 2 oz. each ivory black, copperas, and neatsfoot oil, 4 oz. brown sugar, 4 oz. soft water, and 1 oz. gum tragacanth; boil until the water has evaporated, stir until cold, then roll into balls or mould into cakes.

23. A fourth is made of ½ lb. beeswax, 4 oz. ivory black, 2 oz. Prussian blue, 2 oz. spirits of turpentine, and 1 oz. copal varnish; melt the wax, stir in the other ingredients, and, when cool, roll into balls.

24. Still another famous harness and saddlery blacking is made of ¼ oz. isinglass, ¼ oz. indigo, 4 oz. logwood, 2 oz. soft soap, 4 oz. glue, and 1 pint vinegar; the whole is warmed, mixed, strained, allowed to cool, and is then ready for use.

25. Mix 1 oz. indigo, 1 lb. extract of logwood, 1 oz. softened glue, and 8 oz. crown soap (common soft soap can be used if the other cannot be had) in 2 qt. vinegar; place the mass over a slow fire, and stir until thoroughly mixed. Apply with a soft brush, and use a harder one for polishing.

26. *Restoring Leather-covered Mountings.*—Melt 3 parts white wax, then add 1 part gum copal, dissolved in linseed oil, and 1 of ivory black; allow the mass to boil for five minutes, remove it from the fire, stir until cold, and roll up into balls.

27. For the flesh side mix together 1 lb. prime lampblack and 12 lb. pure neatsfoot oil; melt 6 lb. good tallow, and add it while hot to the lampblack and oil. Mix well, and when cold it will be fit for use.

28. Another: to 1½ lb. lampblack add 1 gal. pure neatsfoot oil and 1 qt. vinegar black; allow it to stand twenty-four hours, and it will be ready for use.

29. *Crown Soap Black.*—Dissolve, over a slow fire, 1 lb. beeswax, 1 lb. crown soap, 3 oz. indigo, 4 oz. ivory black, and ½ pt. oil of turpentine; as soon as dissolved, remove from the fire, and stir until cold.

30. Take 6 oz. turpentine, 3 oz. beeswax, 1½ oz. ivory black, ½ oz. indigo blue, ½ oz. ink. Cut the beeswax fine, pour the turpentine on it, let it stand covered five or six hours, and mix well together; to be kept covered.

31. Digest 12 parts shellac, 5 white turpentine, 2 gum sandarac, 1 lampblack, with 4 of spirits of turpentine and 96 of alcohol.

32. *For Russet Leather.*—Mix together 1 part palm oil and 3 parts common soap, and heat up to 100° F.; then add 4 parts oleic acid, and 1¾ of tanning solution, containing at least ⅛ of tannic acid (all parts by weight) and stir until cold. This is recommended as a valuable grease for russet leather, and as a preventive of gumming.

33. *Cordova Wax.*—Mix together 1½ pt. red acid (chromic), 1 pt. beer, 1 gill thick glue, 2 oz. ivory black, and 1 dr. indigo; boil for half hour and apply with a sponge.

34. *Wax Polish.*—Melt together 1 lb. white wax, 1 lb. crown soap, 2 oz. ivory black, 5 oz. indigo, and ½ pt. nut oil; dissolve over a slow fire, stir until cool, and turn into small moulds.

35. *French Polish.*—½ lb. logwood chips, ¼ lb. glue, ¼ oz. indigo, ¼ oz. soft soap, ¼ oz. isinglass; boil in 2 pt. vinegar and 1 pt. water for quarter of an hour; strain and bottle for use. The leather must be freed from dirt, and the polish applied with a piece of sponge.

36. *Vaseline Harness Composition.*—Prussian blue, in fine powder, ¾ oz.; lampblack, 4 oz.; molasses, 2 oz.; soft soap, 2 oz. Mix together in a large Wedgwood mortar, previously warmed, and add: Vaseline, 6 oz.; ceresin, 5 oz.; yellow resin, ½ oz. Melted together, then sufficient turpentine to give the composition the proper consistency. Mix thoroughly.—*Chem. and Drug.*

37. To preserve harness and leather exposed to the action of ammonia given off in stables, and which causes it to rot, although it may be protected by grease, is to add to the oil or fat that is employed a small quantity of glycerine, which is said to keep the leather always soft and pliable.

38. Black Harness Lacquer.—Dissolve 40 parts of best shellac, 10 parts of sandarac, and 5 parts of mastic in 500 parts of spirits of wine. To prevent it from becoming brittle, add to the solution 20 to 30 parts of Venetian turpentine, and finally sufficient aniline black (nigrosine) dissolved in water or spirits of wine to color.

39. A waterproof liquid is made from India rubber in chips, 1 oz., and boiled oil 1 pt., dissolving by the aid of heat, then finally stir in another pint of hot boiled oil. Another waterproof composition is boiled oil, 1 pt.; 2 oz. of beeswax; 2 oz. of yellow resin, and melt all together. Or, take 1 pt. of salad oil, 4 oz. mutton suet, 1 oz. spermaceti, 1 oz. white wax, and melt together. Another is prepared from 2 oz. bisulphide of carbon, ½ oz. gutta percha, 2 oz. asphaltum, ½ oz. brown amber, 1 oz. linseed oil. First dissolve the gutta percha in bisulphide of carbon, and the asphaltum and amber in the oil, and thoroughly mix together.

40. A lacquer for harness makers is prepared from the following: 5 parts of colophony; lampblack, 1 part; mastic, 2 parts; sandarac, 5 parts; shellac, 20 parts; Venetian turpentine, 5 parts; spirits of wine, 100 parts.

41. Composition by Farnham of glycerine and other resinous substances used for forming a base for a high polish, rendering it impervious to water and preserving the flexibility of the leather; resinous substances by themselves are objectionable, because in becoming dry they crack and cause the leather to break, but by mixture with glycerine the composition formed excludes the water and preserves the softness. It is made as follows: 1 gal. 94% alcohol, 1 lb. Venice turpentine, 1 lb. gum shellac, 1 lb. glycerine, 4 oz. myrtle wax, and fine lamp or ivory black to give color and consistency. It is prepared by digesting the gum in the alcohol till dissolved, a portion of the glycerine is used in grinding the myrtle wax, and a portion in grinding the blacking so as to render it soluble in alcohol. Mix all thoroughly and apply with a sponge or brush; castor oil may be used with the glycerine resin for carriage tops and other work where a brilliant polish is not required.—*Harness.*

Blacking Metals.—*Brass.*—The dead black on optical instruments is produced by dipping in a solution of chloride of platinum. To make this, take 2 parts hydrochloric acid, 1 part nitric acid, mix in a glass bottle and put in as much platinum foil as the acid will dissolve when placed in a warm sand bath, or to hasten the solution, heat to nearly the boiling point of the acids. ½ oz. nitric and 1 oz. hydrochloric acid will absorb about 30 grn. platinum, but in order to neutralize the acid, it is better to have a surplus of platinum. Dip the article or brush in the chloride.

Lustrous Black on Brass.—Mix equal parts of copper sulphate and sodium carbonate. These solutions must be hot. Wash the precipitate as it lies on the filter paper, and dissolve immediately in ammonia; there should be an excess of ammonia. Dilute the solution with water (¼), and add a small quantity of plumbago, 20 to 50 grn., depending on the amount of solution used, then heat to 100° F. The brass articles must be thoroughly cleaned and left in this bath until they are black; wash well in water and dry in sawdust. Prepare only as much solution as is wanted for immediate use.

Blue-black Coating for Brass.—7 oz. copper carbonate is dissolved in 1½ qt. of strong ammonia. A precipitate is formed, and the solution is diluted with 1 qt. water.

Blacking for Optical Instruments and Other Brass Work—1. For dead black for inside of tubes use alcoholic shellac varnish and lampblack, equal parts by weight, and thin with enough alcohol to make it flow freely with the brush.

2. Dissolve in 4¾ fl. oz. of ammonia ½ oz. copper carbonate, stirring constantly while dissolving. Add ½ pt. water. The articles should be suspended in this solution by brass or copper wires, for a short time. This coating is durable in the open air.

3. Optical and philosophical instruments made in France often have all their brass surfaces of a fine dead black color, very permanent and difficult to imitate. The following, obtained from a foreign source, is the process used by the French artisans: Make a strong solution of nitrate of silver in one dish, and of nitrate of copper in another. Mix the two together and plunge the brass into it. Remove and heat the brass evenly until the required degree of dead blackness is obtained.

4. The best means of producing a black surface on brass, pinchbeck, or silver is said to be platinum chloride, which is allowed to liquefy by exposure to the air. It is rubbed in with the finger, or, best, with the ball of the thumb. After blacking, the object is washed and polished with oil and leather. Platinum chloride is dear, but a little of it will do a great deal of work.

5. Black Brasswork for Instruments.—Take lampblack, about a thimbleful, and put it on a flat stone or smooth slate; add four or five drops of gold size, and mix well with a palette knife, make the whole about as thick as putty; mix well. The less gold size there is the better, so that the lampblack just sticks together; if too much gold size be added, the effect will be a bright black and not a dead black. Now add turpentine, about twice its own volume, to the whole, mix with a camel hair brush, and apply to the brasswork.

Dull Black on Copper.—Brush over the copper with a solution of platinum chloride diluted with five times its bulk of water. When thoroughly dry rub off with an oiled flannel rag.

Black or Enameled Copper.—Clean the copper thoroughly with sand and sulphuric acid, then apply the following mixture: 3 parts white arsenic; 6 parts hydrochloric acid; 1½ parts sulphuric acid; water, 36 parts.

Gun Metal.—For blacking gun barrels, 2 oz. solution of nitric acid, 4 oz. tincture of iron, 3 oz. spirits of wine, 3 oz. sweet spirits of niter, 1 oz. vitriol blue, 1½ pt. of rain water. Scour the barrel smooth; remove all grease with lime, then coat freely with the mixture with a piece of sponge, but not so as to run about the barrel. Let stand in a cool place for about 10 hours; then remove to a warm room, and let stand till dry, when the rust will fly off, and not be sticky or streaky. The barrels are not dry, and must stand until quite dry, or the result will be a red barrel. The scratching must be done with lard, then boil for about 10 minutes; take out and wipe inside and out; let stand till cool, then scratch to remove the dead rust; wipe with clean rag, then coat with the mixture lightly; let it stand till dry. Scratch, boil, etc., as in first coat for six coats, when the barrels may be finished by oiling.

Black on Gun Barrels.—First take chloride of mercury and sal ammoniac; second, perchloride of iron, sulphate of copper, nitric acid, alcohol and water; third, perchloride and protochloride of iron, alcohol and water; fourth, weak solution of the sulphide of potassium. These solutions are successively applied, each becoming dry before the other is used. No. 3 is applied twice, and a bath of boiling water follows Nos. 3 and 4. The shade of color is fixed by active friction with a pad of woolen cloth and a little oil. The shade thus obtained is a beautiful black of uniform appearance. This process is used in the manufacture of arms at St. Etienne, France. We regret that the proportions of the different ingredients are not given. Several of our gunsmiths have made many inquiries as to the mode of producing the blue-black coating on the Whitworth and other English rifles. Perhaps the above solution will effect the object. The alcohol is used to make the application dry quickly. The perchloride of iron and the sulphate of copper in No. 2 should be used only in a moderately strong solution, and only about 10 % of nitric acid added to the water. We hope that our gunsmiths will meet with success in using these solutions. No. 2 applied in three or four coats will form the common brown coating for gun barrels. After the last application has become dry it is rubbed with a wire scratch brush, washed with warm water, then dried, and afterward rubbed down with a composition of beeswax dissolved in turpentine.

Black Polish on Iron and Steel.—Oil of turpentine, 15 parts; sulphur, 1½ parts. Boil together. Put a very thin coat on the article, and hold over the flame of an alcohol lamp.

Black having a Polish for Iron.—Pulverized asphaltum, 1 lb.; gum benzoin, ⅛ lb.; spirits of turpentine, 2 qts. If needed quickly keep in a warm place, shaking very often. It can be shaded well with ivory black finely ground. It should be used on iron exposed to the weather as well as interior work requiring a nice polish. Apply with a brush.

Blacking for Metal.—1. Take 4 parts turpentine, 1 part gold size, or copal varnish. Add best vegetable black till the whole is of the consistence of thin cream. Grind and strain through muslin. Apply quickly once over the work, with a soft haired brush, and dry off in a warm room or hot closet. This is the Berlin black used by stove grate makers. It is also used in some classes of optical instruments.

2. Chloride of platinum painted on zinc gives a very dead black.

3. Vegetable or drop black, mixed with 6 parts of turps, 1 part japanner's gold size, 1 part terebine.

Zinc, to Blacken.—1. Zinc may be given a fine black color, according to Knaffl, by cleaning its surface with sand and sulphuric acid, and immersing for an instant in a solution composed of four parts of sulphate of nickel and ammonia in forty of water, acidulated with one part of sulphuric acid, washing, and drying it. The black coating adheres firmly, and takes a bronze color under the burnisher. Brass may be stained black with a liquid containing two parts of arsenious acid, four of hydrochloric acid, and one of sulphuric acid, in eighty parts of water.

2. A weak solution of sulphate of copper, and then with a decoction of logwood.

Blacking for Boots and Shoes.—As this is a subject on which numerous calls for information have been made in the *Scientific American*, the greater portion of the receipts in "Cooley" and in the "Workshop Receipts" will be published entire. The article on Leather Polishes in the fourth volume of "Workshop Receipts" is probably the most complete and reliable in the language. Many later receipts collected from the journals have been added.

Liquid.—1. The well-known liquid blacking of Day & Martin is prepared in the following manner: Very finely ground animal charcoal, or bone black, is mixed with sperm oil till the two are thoroughly commingled. Raw sugar or molasses, mixed with a small portion of vinegar, is then added to the mass. Next a small measure of dilute sulphuric acid is introduced, which, by converting into sulphate a large proportion of the lime contained in the animal charcoal, thickens the mixture into the required pasty consistence. When all effervescence has subsided, but while the compound is still warm, vinegar is poured in until the mass is sufficiently thinned; then it is ready to be bottled for the market.

2. Animal charcoal 5 oz., molasses 4 oz., sweet oil ¾ oz. Triturate until the oil is thoroughly incorporated, then stir in gradually ¼ pint each vinegar and beer lees.

3. Animal charcoal 1 lb., sperm oil 2 oz., beer and vinegar each 1 pt., or sour beer 1 qt.

4. Bryant & James' India rubber blacking. India rubber in very fine shreds 1s oz., hot rapeseed

oil 9 lb. (1 gal.), animal charcoal in fine powder 60 lb., molasses 45 lb., gum arabic 1 lb., previously dissolved in vinegar, No. 24 strength, 20 gal. The mixture is triturated in a color mill until perfectly smooth, then placed in a wooden vessel, and sulphuric acid is added in small successive quantities amounting altogether to 12 lb. This is stirred for half an hour daily for fourteen days, then 3 lb. of finely ground gum arabic are added, and the stirring is repeated for an additional fourteen days, when the blacking will be ready for use.

5. It has been proposed to treat the leaves and other portions of the mastic gum tree, *Pistacia lentiscus*, by decoction or distillation, principally to obtain from them a blacking which dries almost immediately after application, shines without the necessity of being brushed, and is much less liable to soil the clothes.

6. Acme Blacking.—To 1 gal. rectified spirit is added 21 drm. blue aniline and 31 drm. Bismarck brown aniline, the solution of the last two being effected by agitation for eight hours to twelve hours. After the solution is completed the mass is allowed to settle, and the liquid portion is drawn off by spigots above the sediment and filtered if necessary. The alcohol is placed in the apparatus first, then the colors, and the mixture agitated every hour for a space of 10 to 15 minutes. Of this liquid ¼ gal. is added to 1 gal. of rectified spirit, and in this are dissolved 11 oz. camphor, 16 oz. Venice turpentine, 36 oz. shellac. To 1 qt. benzine add 3⅛ fl. oz. castor oil and 1⅜ fl. oz. boiled linseed oil. The two solutions are then united by agitation, but should not be allowed to stand over two days in any vessel of iron or zinc, as in the presence of the gums the colors will be decomposed by contact with zinc in eight days, and with iron in eighteen to twenty-four days.

7. A quantity of ordinary starch is dissolved in hot water, and while still hot, oil or wax is added; the mixture is stirred and allowed to cool. When cold, a small quantity of iodine is added to give a bluish black color. To 1 gal. of this are added 8 oz. of a solution of iron perchloride, a small quantity of gallic or tannic acid (or both), and sometimes about 2 drm of oil of cloves with 8 oz. glycerine. The whole is thoroughly stirred.

8. Nicolet, of Lyons, prepares boot blacking by dissolving 150 parts wax and 15 of tallow in a mixture of 200 of linseed oil, 20 of litharge and 100 of molasses, at a temperature of 230° to 250° F. (110° to 120° C.) After this, 103 parts lamp black are added, and when cold it is diluted with 280 of spirits of turpentine, and finally is mixed with a solution of 5 of gum lac and 2 of aniline violet in 35 of alcohol.

9. Hein, in Kaufering, makes another kind of shoe blacking by melting 90 parts beeswax or ceresine, 30 of spermaceti and 350 of spirits of turpentine, with 20 of asphalt varnish, and adds 10 of borax, 20 of lamp black, 10 of Prussian blue and 5 of nitro-benzol.

10. Brunner uses 10 parts bone black, 10 of glucose sirup, 5 of sulphuric acid, 20 of train oil, 4 of water and 2 of soda carbonate. The bone black and glucose are stirred with the acid in a porcelain vessel until the whole mass is homogeneous and has a shining black surface when at rest. The soda is dissolved in a little water, and boiled with the oil under constant stirring until it forms a thick liquid; then the other mixture is stirred into it. By varying the proportions of these two mixtures the blacking is made thinner and softer, or harder and firmer. The substances sold as French polish are mostly composed of these ingredients. In this and all other kinds of shoe blacking made with bone black and sulphuric acid, the precaution must be observed of stirring rapidly and evenly after the acid is added, otherwise lumps will be formed that are difficult to crush, and the blacking will have a granular condition that does not belong to it.

11. A good liquid blacking may be prepared by mixing 3 lb. lampblack with 1 qt. stale beer and ½ pint sweet oil, adding thereto 1 oz. molasses, ¼ oz. green copperas, and ¼ oz. logwood extract. This furnishes a blacking which polishes easily and well.

12. Cheap and Good Shoe Blacking.—To 1 lb. best ivory black add 1 lb. molasses, 8 tablespoonfuls sweet oil, dissolve 1 oz. gum arabic in 2 qt. vinegar, with ¼ lb. vitriol.

13. Guttapercha.—To 30 parts sirup, contained in a boiler, add 9 of lampblack and 1½ of finest bone-black, and mix the whole intimately together. Heat 1½ part guttapercha, cut into small pieces, in a kettle over a coal fire, until it is nearly all melted, add to it gradually, under constant stirring, 2½ parts olive oil, and when guttapercha is all dissolved, ½ *part stearin*. Pour the latter mixture, while still warm, very slowly and gradually into the first mentioned mixture, and when the whole has been thoroughly incorporated, add a solution of 2⅛ parts gum senegal in 6 of water, likewise stirring. Finally, the product may be aromatized by the addition of 1⅛ part rosemary or lavender oils. This blacking produces a fine gloss of a deep black. It is not injurious to the leather.

14. Take ivory or bone black, any quantity, and to every pound put 1½ oz. measure of sulphuric acid, and well triturate it. It will become damp, like snuff. Next add cod oil, 3 oz. to the lb. If liquid add treacle, 3 oz. to the lb., and small beer to mix, or stale beer if for paste, enough to make up into a paste. Foots sugar is preferable to molasses, and a better black is got by adding ¼ oz. to the lb. of Prussian blue. It is improved if laid up light for a day or two after first manipulation, and again after the second, as a decomposition takes place.

15. A fine, brilliant, elastic dressing for leather can be made as follows: To 3 lb. of boiling water add, with continual stirring, ½ lb. white wax, 1 oz. transparent glue, 2 oz. gum senegal, 1½ oz. white soap, 2 oz. brown candy. Finally, add 2½ oz. alcohol, and, after the whole is cooled, 3 oz. fine Frankfort black. The dressing is thinly applied to the leather with a soft brush, and after it is dried it is rubbed with a piece of fine pumice and polished with a stiff brush.

16. 7 lb. each of ivory black and molasses, well mixed with 2 qt. boiling water; add 2 lb. 10 oz. vitriol, and the previously thin liquid will become quite thick. After the effervescence has ceased add 1 pt. of any common oil—fish oil is the best. If you want it liquid, add stale beer or vinegar.

17. Useful blacking for leather may be made thus: Dissolve 11 lb. of green vitriol and 5 lb. tartaric acid in 9 gal. water. After the settling draw off the clear liquid; then boil 16 lb. logwood with about 18 gal. water and 11 gal. of the fluid. Let the boiled mixture stand for about eight days, pour it off from the sediment, dissolve in it 2 lb. grape sugar, and mix this liquid with the green vitriol solution. The blacking so obtained may be made still brighter by mixing the logwood decoction with 4 lb. aniline black-blue before the addition of the vitriol. The application of the blacking is very simple. The leather is first well brushed with a solution of soda, or still better, with ammonia, in 25 times as much water, to get rid of the grease. The blacking is then applied with the proper brush for the purpose.

18. Finishing Black.—Mix together ½ oz. each gelatine and indigo, 1 oz. logwood extract, 2 oz. crown soap, 8 oz. softened glue, and 1 qt. vinegar; heat the whole over a slow fire, and stir until thoroughly mixed. Apply with a soft brush, and polish with a woolen cloth.

19. Mix a quantity of bone-black with equal parts of neatsfoot oil and brown sugar, in proportions to produce a thick paste; then with vinegar and sulphuric acid in proportions of 3 parts of the former to 1 of the latter.

20. Melt 2 lb. wax, and add ¼ lb. washed and well dried litharge by screening it through a

fine sieve; then add 6 oz. ivory black and stir until cool, but not cold; add enough turpentine to reduce it to a thin paste, after which add a little birch or other essential oil to prevent it from souring.

21. A liquid black is made by mixing 3 oz. ivory black with one tablespoonful citric acid, 2 oz. brown sugar, and a small quantity of vinegar, afterward adding 1 oz. each sulphuric and muriatic acids; mix the whole together, and add a sufficient quantity of vinegar to make 1 pt. in all.

22. Vinegar, 2 pt.; soft water, 1 pt.; glue (fine), 4 oz.; logwood chips, 8 oz.; powdered indigo, 2 dr.; potash bichromate, 4 dr.; gum tragacanth, 4 dr.; glycerine, 4 oz. Boil, strain, and bottle.

23. A German journal gives the following: Mix 200 parts shellac with 1,000 of spirit (95%) in a well stoppered bottle. Keep in a warm place for two or three days, shaking frequently. Separately dissolve 25 parts Marseilles soap in 375 of warmed spirit (25%), and to the solution add 40 of glycerine. Shake well and mix with the shellac solution. To the mixture add 5 parts nigrosin dissolved in 125 of spirit. Well close the vessel and shake energetically, and then leave the mixture in a warm place for a fortnight.

24. Ivory black, 6 lb.; molasses, 4 lb.; gum arabic (dissolved in hot water), 2 oz.; vinegar, 2 gal.; sulphuric acid, 2½ lb.; India rubber dissolved in about 1 pt. of oil, 2 oz. Mix well together. This blacking may be applied by means of a brush, or a small sponge attached to a piece of twisted wire.

25. Boot Top Liquid.—Oxalic acid, 1 oz.; zinc sulphate, 1 oz; water, 30 oz. Dissolve, and apply with a sponge to the leather, which should have been previously washed with water; then wash the composition off with water, and dry. This liquid is poisonous.

26. A waterproof blacking, which will give a fine polish without rubbing, and will not injure leather: 18 parts beeswax, 6 spermaceti, 66 turpentine oil, 5 asphalt varnish, 1 powdered borax, 5 vine twig (Frankfort) black, 2 Prussian blue, 1 nitro-benzol. Melt the wax, add powdered borax, and stir till a kind of jelly is formed. In another pan melt the spermaceti, add the asphalt varnish, previously mixed with the turpentine oil, stir well, and add to the wax. Lastly add the color, previously rubbed smooth with a little of the mass. The nitro-benzol gives fragrance.

27. Without Vitriol.—Take of ivory black (in very fine powder), 2 lb.; molasses, 1½ lb.; sperm oil, ¼ pt.; mix as before; then add of gum arabic, 1 oz. dissolved in strong vinegar, ½ pt.; mix well; the next day further add of good vinegar, or strong sour beer, 3 to 4 pt. (or q. s.); stir briskly for a quarter of an hour, and again once a day for a week. Excellent.

28. Ivory black, 7 lb.; molasses, 6 lb.; sweet oil, 1 lb.; oil of vitriol, ½ lb.; water, q. s., as last.

29. Ivory black, 3 cwt.; crude molasses, 2 cwt.; linseed oil, 3 gal.; oil of vitriol, 20 lb.; water, q. s., as last.

30. Gum shellac, ½ lb.; alcohol, 3 qt.; dissolve and add camphor, 1½ oz.; lampblack, 2 oz. The foregoing will be found to give an excellent gloss, and is especially adapted to any leather the surface of which is roughened by wear.

31. 2 lb. of ivory black in fine powder; molasses, 1½ lb.; ¼ pt. sperm oil Rub the black and oil well together, add the molasses and mix.

32. 4 oz. of ivory black, 3 oz. coarse sugar, a tablespoonful of sweet oil, and 1 pt. of weak beer; and mix them gradually together until cold.

33. For Kid Shoes.—Gum shellac, 2 oz.; aqua ammonia, 1 oz.; water, 8 oz.; black aniline, enough to color. Heat the ingredients slowly together (except the aniline) until the whole is near boiling and the shellac dissolves. It may be necessary to add a little more ammonia during the boiling. Then add the aniline and water (enough to make the whole measure 16 oz.)

34. Liquid Dressing for Shoes.—Gum arabic, 4 oz.; molasses, 1½ oz.; good black ink, ½ pt.; strong vinegar, 2 oz.; spirits of wine, 1 oz.; sweet oil, 1 oz. Dissolve gum in ink, add the oil, rub them in a mortar until thoroughly united; then add the vinegar, lastly the spirit.

35. Liquid Stain Polish for Shoes.—Gum tragacanth, 2 oz.; isinglass, 1 oz.; beer, 1 gal.; glycerine, 1 lb.; extract of logwood, 2 oz.; powdered galls, 1 oz.; copperas, 2 oz. Steep the logwood, galls and copperas in the beer for some days, add the glycerine, strain and dissolve the gum and isinglass in the mixture, and if necessary strain again. This formula makes a preparation suitable for light leather.

36. French Dressing for Shoes.—Logwood extract, 3 oz.; dissolve in 2 qt. of water.; borax, 3 oz., dissolve in soft water, 2 qt., and add ¾ oz. shellac, boil to dissolve; bichromate of potash, ¼ oz., dissolve in soft water, ¼ pt., and add 3 oz. ammonia water, mix all together.

37. The following is a German recipe: Dissolve 3½ oz. of shellac in half a pint of alcohol, Rub smooth 25 grains of lampblack with 6 drm. of cod liver oil and mix. A few drops are to be applied to the leather with a sponge.

38. Ivory black 50 lb., cod liver oil 1 gal., oil of vitriol 10 lb., powdered gum arabic or senegal 1 lb., molasses 4 gal., vinegar 15 gal. Grind together the ivory black, gum and oil with a portion of the vinegar, add the molasses, and while stirring pour in slowly the oil of vitriol. When all action ceases, add the rest of the vinegar.

39. Pour 1 qt. of alcohol of 95% over ½ lb. of ruby shellac, close the flask hermetically, let it stand in a warm place for two or three days, shaking it every day, until the shellac is dissolved. Then dissolve 1 oz. of dry Castile soap in ½ pint of warm alcohol of 95%, add to it 1½ oz. of glycerine, shake thoroughly, and then add this mixture to the solution of shellac. To give the black color, dissolve 1¼ drm. of aniline black, soluble, in 1 gill of alcohol, add this to the other mixture, close the flask hermetically, shake thoroughly, and let the mixture stand in a warm place for fourteen days before using it. To cheapen it you may substitute solution of borax for the alcohol, but the product will dry slowly, and be far inferior in every way.

40. Clausen's ink is made as follows: Nutgalls, 8 parts; logwood extract, 10 parts; boil together in water, q. s., and add Castile soap, 4 parts; glycerine, trace.

41. Crooker's—Logwood extract, 6 oz.; water, 1 gal.; ivory black, 1·5 oz.; glycerine, 1 oz.; bichromate of potassa, 0·125 oz.; copperas. 0·125 oz.; boil together.

42. Sefton's—Orange shellac, 64 oz.; alcohol, 5 gal.; pure asphaltum, 60 oz.; neat's foot oil, 1 pt.; lampblack, q. s.

43. Ovington's—Water, 1 gal.; logwood extract, 6 oz.; water, 1 gal.; borax, 6 oz.; shellac, 1·5 oz.; water, 0·5 pt.; bichromate of potassa, 0·375 oz. Mix the solutions, and add 3 oz. ammonia.

44. Shaw's—Borax, 3 oz.; orange shellac, 5 oz.; water, q. s.; boil and add soluble aniline black or nigrosine, q. s. Rub the spots with strong aqueous solution of ferric chloride, and dry before applying the dressing.

1. *Automatic Blacking; Self-shining Blacking.*—Gum arabic, 4 oz.; molasses or coarse moist sugar, 1½ oz.; good black ink, ¼ pt.; strong vinegar, 2 oz.; rectified spirit of wine and sweet oil, of each 1 oz.; dissolve the gum in the ink, add the oil, and rub them in a mortar or shake them together for some time, until they are thoroughly united, then add the vinegar and lastly the spirit.

2. Lampblack, ¾ oz.; indigo, in powder, 1 drm.; put them in a mortar and rub up with sufficient mucilage, made by dissolving 4 oz. of gum in ¼ pt. of strong vinegar, to form a thin paste; add

very gradually 1 oz. of sweet oil, and triturate until their union is complete, adding the remainder of the mucilage; then further add 1½ oz. of molasses, and afterward successively 2 oz. of strong vinegar; alcohol, 1 oz.; lastly, bottle for use.

3. Mix the whites of 2 eggs with a tablespoonful of alcohol, 2 large lumps of sugar, crushed, and sufficient finely powdered ivory black to give the required color and thickness.

Self-shining Dressing for Shoes.—Dissolve 8 oz. gum arabic in 8 oz. of best black ink, then add 2 oz. of olive oil. Mix thoroughly and then add 4 oz. strong vinegar, 3 oz. brown sugar, 2 oz. of alcohol.

Paste blackings are also made in a variety of ways, of which the following are the chief:

1. Bryant & James' India rubber blacking may be made in a solid form by reducing the proportion of vinegar from 20 gal. to 12 gal. The compound then only requires stirring for about six or seven days in order to prepare it for use, and it may be liquefied by subsequent addition of vinegar.

2. Dr. Artus manufactures blacking from the following materials: Lampblack, 3 or 4 lb.; animal charcoal, ½ lb.; are well mixed with glycerine and molasses, 5 lb. Meanwhile gutta-percha, 2½ oz., is cautiously fused in an iron or copper saucepan, and to it is added olive oil, 10 oz., with continual stirring, and afterward stearine, 1 oz. The warm mass is added to the former mixture, and then a solution of 5 oz. gum senegal, in 1½ lb. water, and 1 drm. each of rosemary and lavendar oils may be added. For use it is diluted with 3 to 4 parts of water, and tends to keep the leather soft, and render it more durable.

3. All ordinary paste blackings require to be mixed with some liquid before application, causing considerable waste. It is claimed for the subjoined method of preparation, that by its means the blacking is rendered of such a condition that when merely dipped in water or other solvents the required quantity can be rubbed on to the article to be blacked without the cake crumbling or breaking up. The ingredients of the blacking are those in ordinary use, but it is brought to the required consistence by combination with Russian tallow, in the proportion of 3%, and casting the mass into the desired forms. These may be cylindrical, etc., and may be inclosed in covers of cardboard, tinfoil, etc., in which the blacking can slide, so that when one end is pushed out for use, the remainder acts as a handle. The exposed end when damped by immersion or otherwise can be rubbed on the article without crumbling. The ivory black, animal charcoal, which has been used in the preparation of white paraffin, according to Letchford & Nation's patent, may be conveniently used for making blacking.

4. The addition of sulphuric acid to animal charcoal and sugar produces lime sulphate and a soluble acid lime phosphate, which make a tenacious paste. Thus: Animal charcoal, 8 parts; molasses, 4 parts; hydrochloric acid, 1 part; sulphuric acid, 2 parts. These are well mixed. A liquid blacking may be produced from this by the addition of the necessary proportion of water.

5. Fuller's earth, 8 oz.; molasses, 3 lb.; animal charcoal, 2 lb.; butter scrapings, 4 oz.; rapeseed oil, 4 oz.; strong gum water, ½ pt.; powdered Prussian blue, ½ oz.; commercial sulphuric acid, 8 oz. If the blacking is required in a liquid form, add ½ gal. vinegar.

6. To 1 lb. animal charcoal add 4 oz. commercial sulphuric acid; work them well together, and when the acid has done its duty upon the charcoal add 4 oz. fish or colza oil; stir the mixture till the oil is thoroughly incorporated, then pour in gradually a strong solution of washing soda or other suitable antacid, and continue the stirring till ebullition ceases or the acid is neutralized. Next add about 8 oz. molasses, and then pour in a solution of gelatine and glycerine, in quantity about 2 qt. if liquid blacking is required, but less will suffice to produce paste. The solution of glycerine and gelatine is made by dissolving the best size in hot water, in the proportion of 4 parts water to 1 part of size, and then adding to every qt. of the liquid 1½ oz. glycerine. The addition of the glycerine and gelatine preparation gives great brilliancy, depth of color, and permanency to the blacking when applied to leather, and at the same time makes it damp proof; besides which the antacid has the effect of neutralizing the sulphuric acid employed, and thus prevents the injurious action of that acid on the leather, as in the case of most ordinary blackings.

7. Soften 1 part white glue in water, add 3 parts crown soap, and heat the whole over a slow fire until the glue is thoroughly dissolved; moisten 3 parts bone black with vinegar, and mix it with 1 part wheat starch, beaten smooth in cold water; mix the whole and allow it to stand over a slow fire for half hour, stirring it all the time; then turn it into another kettle and stir until it is cold. To use, dissolve a small quantity in sour beer or vinegar, and apply with a brush, spreading it as thinly as possible.

8. A leather varnish or polish is prepared by Gunther, of Berlin, by mixing a filtered solution of 80 parts shellac in 15 parts of alcohol, with 3 parts of wax, 2 parts of castor oil, and a sufficient quantity of pigment. The mixture is evaporated in vacuo to a sirup. The varnish is applied to the leather with a brush moistened with alcohol or with a colorless alcoholic varnish.

9. Soften 2 lb. good glue, and melt it in an ordinary glue kettle; then dissolve 2 lb. Castile soap in warm water and pour it into the glue; stir until well mixed, and add ½ lb. yellow wax cut into small pieces; stir well until the wax is melted, then add ½ pt. neats' foot oil and enough lampblack to give the desired color. When thoroughly mixed, it is ready for use.

10. Molasses, 1 lb.; ivory black, 1¼ lb.; sweet oil, 2 oz.; rub together as before, then add a little lemon juice or strong vinegar.

11. Ivory black, 2 lb.; molasses, 1 lb.; olive oil and oil of vitriol, of each ¼ lb.; water, q. s. as before.

12. Ivory black, 28 lb.; molasses, 21 lb.; common oil, 1 qt.; oil of vitriol, 3 lb.; water, q. s.

13. Ivory black, 3 cwt.; molasses, 2 cwt.; linseed oil and vinegar bottoms, of each 3 gal.; oil of vitriol, ¼ cwt.; wate., q. s.

14. Ivory black, 25 lb.; molasses, 2 gal.; oil of vitriol, 4 lb.; cod liver oil, 4 gal.; vinegar, 6 gal.; powdered gum arabic or senegal, ½ lb. All the ingredients except the oil of vitriol are first thoroughly mixed and ground, then the oil of vitriol is slowly stirred in. It is kept for a week and stirred daily to insure combination.

Waterproof.—1. Melt together 4 oz. black resin and 6 oz. beeswax over a slow fire; when thoroughly dissolved, add 1 oz. lampblack and ¼ lb. finely powdered Prussian blue; stir the mixture well, and add sufficient turpentine to make thin paste. Apply with a cloth and polish with a brush.

2. Liebig's.—Mix bone black in ½ its weight of molasses and ⅛ its weight of olive oil, to which add ½ its weight of hydrochloric acid, ¼ its weight of strong sulphuric acid, with a sufficient quantity of water to produce a thin paste.

3. Molasses, 1 lb.; ivory black, 1¼ lb.; sweet oil, 2 lb. Rub together in a Wedgwood mortar till all the ingredients form a perfectly smooth homogeneous mixture; then add a little lemon juice or strong vinegar—say the juice of one lemon, or about a wineglassful of strong vinegar—and thoroughly incorporate, with just enough water added slowly to gain the required consistency.

4. Ivory black, 2 lb.; molasses, 1 lb.; olive oil, ¼ lb.; oil of vitriol, ¼ lb. Add water to gain required consistency.

5. Take 1 part ivory black, ⅛ part of melted tallow, and work up well in a mortar. Incorporate with this paste ½ part treacle, ¼ part of sulphuric acid, and ⅛ part of spirits of salt. This will form an excellent paste blacking.

6. Waterproof Blacking.—James & Bryant's. Dissolve 6 oz. caoutchouc in 3 lb. rape oil (hot). Add 20 lb. ivory black; 15 lb. molasses; and 6 or 7 gal. vinegar, in which 6 oz. ground gum arabic has been dissolved. Work perfectly smooth and add 4 lb. sulphuric acid, stirring constantly. Let it stand for two weeks, then add 1 lb. fine gum arabic; stir daily for two weeks longer and bottle.

7. Boiled oil, 1 pt.; oil of turpentine, black resin, and beeswax, of each, 3 oz. *Proc.* Melt the wax and resin, then stir in the oil, remove the pot from the fire, and when it has cooled a little, add the turpentine.

8. Take 3 oz. spermaceti, and melt it in a pipkin, or other earthen vessel, over a slow fire; add thereto 6 drm. India rubber, cut into slices, and these will presently dissolve. Then add in order tallow, 8 oz.; hog's lard, 2 oz.; amber varnish, 4 oz. Mix, and it will be fit for use immediately. The boots or other material to be treated are to receive two or three coats, with a common blacking brush, and a fine polish is the result.

For application to dress boots the following compositions are prepared: 1. Gum arabic, 8 oz.; molasses, 2 oz.; ink, ½ pt.; vinegar, 1 oz.; spirit of wine, 2 oz. Dissolve the gum and molasses in the ink and vinegar, strain, and then add the spirit of wine.

2. Mix together the whites of 2 eggs, 1 teaspoonful spirits of wine, 1 oz. sugar, and as much finely pulverized ivory black as may be required to produce the necessary shade of black. Apply with a sponge, and polish with a piece of silk.

3. Mix together ½ lb. each ivory black, purified lampblack, and pulverized indigo, 3 oz. dissolved gum arabic, 4 oz. brown sugar, and ¼ oz. glue dissolved in 1 pint water; heat the whole to a boil over a slow fire, then remove, stir until cold, and roll into balls.

Miscellaneous Greases, Blacking, etc. See also **Boots and Shoes.**

Boot-top Liquid.—1. Oxalic acid and white vitriol, of each 1 oz.; water, 1½ pt. *Proc.* Dissolve and apply with a sponge to the leather, previously washed with water, then wash the composition off with water, and dry. This liquid is poisonous.

2. Mix in a vial, 1 drm. of oxymuriate of potass. with 2 oz. of distilled water; and when the salt is dissolved add 2 oz. of muriatic acid. Then shake well together, mix in another vial 3 oz of rectified spirit of wine with ½ an oz. of the essential oil of lemon, unite the contents of the two vials, and keep the liquid thus prepared closely corked for use. This liquid should be applied with a clean sponge, and dried in a gentle heat; after which, the boot-tops may be polished with a proper brush, so as to appear like new leather.

3. Sour milk, 1 qt.; gum arabic, 1 oz.; juice of 2 lemons; white of 2 eggs; oil vitriol, 2 oz. Mix.

4. Sour milk, 1 qt.; butter of antimony, cream of tartar, tartaric acid, and burnt alum, of each 2 oz. Mix.

Nubian Blacking.—The blacking: Rectified (or methylated) spirit, 1 gal.; mother liquid, ½ gal. Mix, and add camphor, 11 oz.; Venice turpentine, 16 oz.; shellac, 31 oz. Dissolved in 40 oz. benzine, 3¼ oz. castor oil, and 1¾ oz. of boiled linseed oil. Mother liquid: This is the coloring agent, and it is a solution of aniline colors in spirit, viz.: Blue-blue aniline, 20·8 drm.; Bismarck-brown aniline, 31·2 drm.; rectified spirit, 1 gal. It is this mother liquid which is the special claim of the patent.

Boots, Grease for.—Dr. Alexander Zoroastroff, of Belostok, recommends a grease for boots which is said to prevent sore feet entirely. The ointment is made of 4 parts of lard, 4 parts of olive oil, and 1 part of caoutchouc—raw rubber—which are melted together on a slow fire. Having moistened the sole of the boot with water, the inventor warms the boot in a stove or before a fire, and then smears it over with the compound. The boot is said to become soft, pliable, shining, waterproof, and even more durable.

"*Treer's*" *Blacking.*—Dissolve gum tragacanth in water, then add a little ink to make it black, and finally add a small quantity of neat's foot oil. It must be quite thin, or else, if thick, it is likely to cake.

Blacking, Stove.—1. Mix 2 parts of black lead, 4 parts of copperas, and 2 parts of bone black, with water, so as to form a creamy paste. This is an excellent polish, as the copperas produces a jet black enamel, causing the black lead to adhere to the iron.

2. Plumbago, 2 lb.; water, 8 oz.; turpentine, 8 oz.; sugar, 2 oz. Knead thoroughly and keep in tin boxes. Apply with a brush.

3. Plumbago, make into a thin paste with sodium silicate or water glass. This makes an excellent stove polish and should be brushed thoroughly.

4. Pulverized black lead, 2 lb.; spirits of turpentine, 2 gal.; water, 2 oz.; sugar, 2 oz. Mix.

5. Mix 5 parts black lead, 5 parts bone black and 10 parts of iron sulphate. Use water q. s. to form a paste. This is an excellent preparation and the coating is very permanent.

6. Reduce graphite to an impalpable powder by grinding in a mill with water, dry; use with water first, then dry and polish. This is the base of nearly all commercial stove polishes.

7. Turpentine and black varnish, put with any good stove polish, is the blacking used by hardware dealers for polishing heating stoves. If properly put on, it will last throughout the season.

Paste Stove Polish.—Pulverized black lead, 2 lb.; spirits of turpentine, 2 gal.; water, 2 oz.; sugar, 2 oz.; mix.

Liquid Stove Polish.—Bone black, 2½ parts; pulverized graphite, 2½ parts; copperas, 5 parts; water, q. s. to form a creamy paste.

Liquid Black Lead Polish.—Pulverized black lead, 1½ lb.; turpentine, 1½ gill; water, 1½ gill; sugar, 1½ oz.

Bone Black Polish.—Mix 2 parts copperas. 1 part powdered bone black, and 1 part black lead with enough water to give proper consistency, like thick cream. Two applications are to be recommended.

Brunswick Black for Grates, etc.—Asphaltum, 5 lb.; melt and add boiled oil, 2 lb.; spirits of turpentine, 1 gal; mix.

Black Pigments. See **Pigments.**

Bladders, to Prepare.—Soak them for twenty-four hours in water, to which a little chloride of lime or potassa has been added, then remove the extraneous membranes, well wash them in clean water, and dry them.

Blankets, to Clean. See **Cleansing.**

Blasting.—In small blasts, 1 lb. of powder will loosen about 4½ tons of rock. In large blasts 1 lb. of powder will loosen 2½ tons. Fifty or 60 lb. of powder inclosed in a bag and hung against a barrier will demolish any ordinary structure. One man can bore with a bit 1 in. in diameter from 50 to 60 in. per day of ten hours in granite, or 300 to 400 in. per day in limestone. Two strikers and a holder can bore with a bit 2 in. in diameter 10 ft. per day in rock of medium hardness.

Bleaching.—The remarkable bleaching compound of Mr. Charles Toppan, of Salem, Mass., consists of 3 parts, by measure of mustard seed oil, 4 parts melted paraffine, 3 parts caustic soda, 20° Be., well mixed to form a saponaceous compound. Of this, 1 part of weight and 2 parts pure tallow soap are mixed, and of this mixture 1 oz. for each gal. of water is used for the bleaching bath, and 1 oz. caustic soda,

20° Be., for each gal. is added, when the bath is heated in a close vessel, the goods entered, and boiled "until sufficiently bleached."

Bleaching Fluid, Instantaneous.—In 5½ pt. of water heated to 190° or 212° Fah. are introduced successively: Mother of pearl, 3½ oz.; indigo, 0·75 grn.; cochineal, 0·75 grn.; chloride of lime, 150 grn.; soda crystals, 150 grn.; potash, 150 grn. Boil for half an hour, and the preparation is ready for use. The inventor, M. Boiseller, says: "The mother of pearl gives softness, luster, suppleness, etc., and gives to hemp the feel of cashmere; the indigo gives a slight azure tint, the cochineal adds brightness, the chloride effects the bleaching, the soda washes and brushes and the potash removes all grease."

Bleaching Powder, or Chloride of Lime, is prepared by passing chlorine gas into boxes of lead in which a quantity of slaked lime is laid on shelves. The stuff to be bleached is first boiled in lime water, wash, and without drying boil again, in a solution of soda or potash; wash, and without drying, steep in a weak mixture of chloride of lime and water for six hours; wash, and without drying, steep for four hours in a weak solution or mixture of sulphuric acid and water; wash well and dry; upon an emergency chlorate of potash mixed with 3 times its weight of common salt, and diluted in water, may be used as a bleaching liquid.

Beeswax, to Bleach.—Pure white wax is obtained from the ordinary beeswax by exposure to the influence of the sun and weather. The wax is sliced into thin flakes and laid on sacking or coarse cloth, stretched on frames, resting on posts to raise them from the ground. The wax is turned over frequently, and occasionally sprinkled with soft water if there be not dew and rain sufficient to moisten it. The wax should be bleached in about four weeks. If on breaking the flakes the wax still appears yellow inside, it is necessary to melt it again, and flake and expose it a second time or even oftener, before it becomes thoroughly bleached, the time required being mainly dependent upon the weather. There is a preliminary process, by which, it is claimed, much time is saved in the subsequent bleaching; this consists in passing melted wax and steam through long pipes, so as to expose the wax as much as possible to the action of the steam; thence into a pan heated by a steam bath, where it is stirred thoroughly with water and then allowed to settle. The whole operation is repeated a second and third time, and the wax is then in condition to be more readily bleached.

Bristles, to Bleach.—The bristles are cleansed well in a preparation of tepid water and soft soap. They are then dipped in cold water. For two or three days they are then left in an aqueous solution of sulphurous acid, after which they are washed and dried.

Bones, to Bleach.—Dip the bones for a few moments in a boiling solution of 1 lb. caustic soda in 1 gal. of water, then rinse thoroughly in water, rub down with fine pumice stone, and expose until whitened to the vapor of burning sulphur largely diluted with air, then rinse in warm water. Bones may also be whitened by exposure in a weak solution of javelle water.

Calico, to Bleach.—Boil in strong solution of caustic soda, rinse thoroughly in clean water; steep for half an hour in a strong, clear solution of chloride of lime in water; wring out, and pass through water containing 3% sulphuric acid, rinse thoroughly in running water, dry.

Bleaching Coral.—First well wash in very dilute hydrochloric acid; then well rinse in water; then put into some chloride of lime and water.

Bleaching Cotton.—Make a strong solution of chloride of lime (hypochlorite of lime—bleaching powder) in water, allow to settle, and draw off the clear liquid. Rinse the goods in clean water containing about 5% of sulphuric acid, and then pass them slowly through the bleaching solution. They should then be well rinsed in water containing a little carbonate of soda. If the cloth is much colored it may be necessary to allow it to remain for a short time in the bath. This is the usual method of bleaching in laundries.

Engravings, to Bleach.—Immerse the prints for one minute in javelle water, and then wash thoroughly in water containing a little hyposulphite of soda. To prepare the javelle water take 4 lb. of bicarbonate of soda and 1 lb. of chloride of lime, put the soda in a kettle over the fire, add 1 gal. of boiling water, let it boil from ten to fifteen minutes, then stir in the chloride of lime, avoiding lumps. When cold the liquid can be kept in a jug or a bottle ready for use.

Feathers, to Bleach.—1. The feathers are put into a bath of permanganate of potash, containing 4 to 5 parts permanganate to 1,000 of water; a solution of sulphate of magnesia of the same strength is added, and it is heated 140° F. (60° C.) at the most. The feathers, previously washed, are put into this bath, then taken out, rinsed, and passed through weak sulphuric acid at about 1½° to 3° Tw.

2. It is also possible to bleach the feathers in a bath of 1 part barium peroxide in 100 parts of water at 86° F. (30° C.) Leave forty-eight hours in this solution, wash, pass through weak acid bath, and wash.

3. Feathers may be bleached by exposure to the vapor of burning sulphur (sulphurous acid) in a moist atmosphere, but it is usually necessary to remove the oily matters from them before they can be satisfactorily so bleached. This may be accomplished by immersing them for a short time in good naphtha or benzine, rinsing in a second vessel of the same, and thoroughly drying by exposure to the air. This treatment does not injure the feathers.

Flannel, Bleaching of.—Flannel which has become yellow with use may be bleached by putting it for some days in a solution of hard soap to which strong ammonia has been added. The best proportions are 1½ lb. hard curd soap, 50 lb. soft water, and ⅔ lb. strong ammonia solution. The same object may be attained in a shorter time by placing the flannel for a quarter of an hour in a weak solution of bisulphite of sodium, to which a little hydrochloric acid has been added.

Bleaching Animal Glue (Muzzarelli).—Add to fine white glue prepared from rabbit skins, for dressing white tissues, a small quantity of sulphate of soda, and mix well; acetate of lead is then added, whereby a precipitate of sulphate of lead is occasioned; the resulting jelly is thus blanched, and after cooling is cut up and dried as usual.—*Science Record,* 1875.

Gutta Percha, to Bleach.—1. Dissolve the gutta percha in twenty times its weight of boiling benzole, add to the solution plaster of very good quality, and agitate the mixture from time to time. By reposing for two days the plaster is deposited and carries down with it all the impurities of the gutta percha insoluble in benzole. The clear liquid decanted is introduced by small portions at a time into twice its volume of alcohol of 90%, agitating continually. During this operation the gutta percha is precipitated in the state of a pasty mass, perfectly white. The desiccation of the gutta percha thus purified requires several weeks' exposure to the air, but may be accelerated by trituration in a mortar, which liberates moisture which it tends to retain.

2. White gutta percha is obtained by precipitating a solution of ordinary gutta percha in chloroform by alcohol, washing the precipitate with alcohol, and finally boiling it in water, and moulding into desired form while still hot.

Hair, to Bleach.—1. A recipe stated to bleach human hair white instead of blond or yellow. Mix 1 lb. hydrogen peroxide with 1 oz. ammonia; mix 4 oz. hydrogen peroxide with 1 oz. cream of tartar dissolved in 1 oz. soda. Blend the two solutions and steep 1 lb. of the hair in

it for three hours. Then wash in clean water with "soapine," in a bath of pottery or clay, and thoroughly dry. Repeat the process fifteen or sixteen times, but thoroughly mix and shake up the hair after the twelfth and every succeeding time. Finally draw the hair through a solution of blue aniline and alcohol.

2. A hot dilute solution of nitric acid is most effectual. Brown hair, when carefully treated, is turned the most brilliant golden, resembling golden spun glass. The method employed is to put the hair in a porcelain dish with dilute NO_2HO (about 1 part strong acid to 10 of water), then gradually heat, and, soon as the required shade is obtained, take out and wash. If the acid is too strong, or the heat too great, the fiber of the hair is spoiled. Dark brown hair acquires generally a reddish color, and black hair will turn nearly white.

Hats, to Bleach.—To bleach Panama hats, wash the goods clean, and while slightly damp, expose to the fumes of burning sulphur in a closed vessel. To color one dozen hats, take 12 lb. logwood, 1 lb. sulphate of iron, and ¾ lb. verdigris. Digest the logwood for some time. Add the sulphate of iron and the verdigris. Dip the hats in the bath several times and hang in the open air. By the peroxidizement of the iron with the atmospheric oxygen the hats will be more completely blackened. When fully dried wash in running water.

Horn.—Besides hydrogen peroxide, horns can be bleached by immersing for a short time in water slightly mixed with sulphuric acid, chloride of lime, or chlorine, or they may be exposed in the moist state to the fumes of burning sulphur, largely diluted with air.

Ivory, to Bleach.—1. First clean the ivory by boiling it with a paste composed of burned pumice stone and water. After cleansing place the article under a glass vessel, and expose it to the sun's rays until it assumes its original whiteness. The ivory should be kept moist with water while bleaching. If the first operation does not succeed perfectly, it should be repeated.

2. Mix a thin lime paste and heat over a moderate fire. Place the ivory in this paste, and leave it until it bleaches white, after which remove the paste, dry and polish.

3. Dr. Artus's process. — The ivory articles are placed in a solution containing 11½ oz. carbonate of soda in crystals and 45⅝ oz. of water, and allowed to remain in solution for 2 days. The articles are then removed from the solution, well washed in pure water, and then smeared for five or six days in a solution composed of 17 oz. of sulphite of soda and 45½ oz. of water. At the end of five or six days there should be added to the solution containing the articles an ounce of hydrochloric acid diluted with 5½ oz. of water. The vessel containing the liquid should then be covered and left standing for from 24 to 26 hours, after which the ivory may be taken out, washed in clean water and dried. The quantities named in this recipe book are sufficient to bleach 2½ oz. of ivory. A glass or porcelain vessel should be used, as the acid will act upon metallic vessels. A very fine polish may be put upon the ivory by the use of putty powder and water applied by means of a rubber made of old felt hat. If the ivory articles are of a character to be placed in a lathe, they may be polished by the use of pulverized pumice stone mixed with water, after which the ivory should be heated by rubbing it, while revolving in the lathe, with a piece of linen or sheepskin, and when it has become hot it should then be rubbed with a little whiting mixed with olive oil, then with a little dry whiting, and finally with a piece of soft white rag.

4. Immerse for a short time in water slightly mixed with sulphuric acid, chloride of lime, or chlorine, or it may be exposed in the moist state to the fumes of burning sulphur, largely diluted with air. Ink stains may be removed by repeatedly using a solution of caustic potash in water.

5. Ivory that has become yellow by exposure can be whitened by washing in a solution composed of 1 oz. of nitric acid and 10 oz. of soft water; apply with a rough brush; cleanse thoroughly with clean water.

6. Peroxide of hydrogen is used in Sheffield to bleach the inferior ivory for knife handles. The mode of procedure is as follows: Place, say, 2 qt. of the liquid in a stone pot, adding 4 oz. of liquid ammonia fort (880°), immerse the handles, and put over a common shop stove for twenty-four to thirty-six hours; the handles are then taken out and gradually dried in the air, not too quickly, or they would split. The deep color of the ivory is removed, and a beautiful pearly white ivory results when polished. The ivory is previously treated with a solution of common soda, to get rid of greasy matter, and open the pores.

7. Antique works in ivory that have become discolored may be brought to a pure whiteness by exposing them to the sun under glasses. It is the particular property of ivory to resist the action of sun's rays when it is under glass; but when deprived of this protection, to become covered with a multitude of minute cracks. Many antique pieces of sculpture in ivory may be seen, which, although tolerably white, are, at the same time, defaced by numerous cracks. This defect cannot be remedied; but, in order to conceal it, the dust may be removed by brushing the work with warm water and soap, and afterward placing it under glass. Antique works in ivory that have become discolored may be brushed with pumice stone, calcined and diluted, and while yet wet placed under glasses. They should be daily exposed to the action of the sun, and be turned from time to time, that they may become equally bleached; if the brown color be deeper on one side than the other, that side will, of course, be for the longest time exposed to the sun.

8. To bleach ivory, place the ivory in a saturated solution of alum for an hour. Polish with a woolen cloth, and wrap in linen to dry. Also with peroxide of hydrogen, to 1 pt. add 1 oz. aqua ammonia. Warm, soak the ivory for twenty-four hours, wipe and polish with chalk.

9. Peineman's Process of Bleaching Ivory which has Turned Yellow.—Place the ivory in a saturated solution of alum, soak for one hour. Rub with a woolen cloth, and wrap in a linen cloth to dry. Another method which is preferred by some is to prepare a thin paste with lime, heat over a fire. Put the ivory in this paste, and let it remain until it becomes white. Take out, dry and polish.

10. To bleach ivory handles of steel tools, protect the steel with a coat of wax or paraffin, and set the handles in a solution of chloride of lime 1 part, water 4 parts, for a day, more or less, then wash the handles with clean warm water, wipe and dry. If satisfactory, warm the metal part and wipe off the wax or paraffin. Another way is to dip the handle in a saturated solution of alum in water for from one to three hours, wash, wipe, and dry. If the handles are not very dark, the latter way is preferable. For polishing the steel points, use putty powder (oxide of tin) on a buff wheel wet with alcohol. This will not stain the handles.

Bleaching Jute.—Jute is still less tolerant of chemical agents than linen, especially of acids. For bleaching 50 lb. the following process is recommended: Make up a solution of 5 lb. soap at 140° F., and pass the jute five times through it. Rinse in clean water. For the chemic bath mix 2½ lb. of chloride of lime with an equivalent quantity of sulphate of magnesia (Epsom's) both dissolved in water. Stir up, let settle, dilute to ½° Tw., steep the jute for three hours in the cold, taking care to keep the goods below the surface of the liquid. Take out and wash well. The operation of exposing vegetable fiber of any kind to sun, air and moisture is known in some parts as "crofting," and in others as "grassing." The process of boil-

ing with alkali and soap is known as "bowking," and the liquid in the keirs is spoken of as the "bowking liquor."—*Crookes.*

To Bleach Lac.—Dissolve shellac in a lye of pearlash by boiling; filter, pass chlorine through it in excess, wash and precipitate; afterward melt it into sticks. This makes an excellent varnish with spirits of wine; its color also renders it good for white and delicate colored sealing wax.

Leaves, to Bleach.—Mix 1 drm. chloride of lime with 1 pt. water, and add sufficient acetic acid to liberate the chlorine. Steep the leaves about ten minutes, and until they are whitened; remove them on a piece of paper, and wash in clean water.

Bleaching, Microscopical. See **Microscopy.**

Oils and Fats.—Many plans of decolorizing oils are in vogue. 1. Exposure to sunlight in large white glass bottles; the oil soon becomes colorless, but acquires an almost rancid flavor.

2. Agitation with 2% of a solution of permanganate of potash bleaches effectually, but also leaves a bad flavor.

3. The oil is first agitated with water containing gum, and to the emulsion thus formed is added coarsely crushed wood charcoal; the whole is then slowly warmed to a degree not reaching 212° F. (100° C.) and when cold the oil is dissolved out by ether or petroleum spirit, and the latter is recovered by distillation; the result is good.

4. The oil, 500 parts, is clarified by addition of 50 parts of China clay and 50 parts of water.

Paraffin.—The crude paraffin is filtered, and boiled for two hours with 5% of its weight of sodium sulphide and sufficient water. It is allowed to cool, so that the mass swimming on the top may become compact and be removed; it is then washed with river water, pressed, and afterward dissolved in 20% amyl alcohol, the paraffin being left as a pasty and pliable mass. It must remain for a time, and then be strongly pressed after filtering through bone black.—*De Molon.*

Piano Keys, Bleaching.—The reason piano keys turn yellow is because they absorb the grease from the fingers; it will, therefore, be necessary to remove this. If a paste made from whiting and a solution of potash is laid on and allowed to remain for about twenty-four hours, the ivories will be restored very nearly, if not quite, to their original color, without removing them from the keys. See **Staining** *Ivory*, below.

Rosin, to Bleach.—Rosin is bleached by melting in a suitable vessel at a temperature of not more than 600° and passing steam through the fluid mass. The steam and rosin are then condensed in a receiver and the product dried. Carbonic acid, or a mixture of carbonic acid and nitrogen or hydrogen gas, are introduced sometimes, to perfect decolorization. Rosin oil is one of the products of destructive distillation of rosin, the residium being tar.

Sails, to Bleach.—Use a solution of chloride of lime in water, in which the sail may be immersed for a short time and then thoroughly washed and dried in the sun. This will whiten it.

Shellac.—1. By exposure in thin threads to the atmosphere.

2. 1 lb. of shellac is dissolved in 4 lb. of very strong alcohol, 1 lb. of bleaching powder—containing at least 20% bleaching chlorine—mixed into a paste with water, strained through linen, and the residue washed with water until the filtrate amounts to 1 lb. It is then mixed with a solution of carbonate of potash in 3 parts of water until no further precipitate is produced. The precipitate is separated by filtration, the warm alcoholic solution of shellac is treated with hydrochloric acid until the mixture is decidedly acid. The shellac then separates as white clots, which are to be washed until the water ceases to pass away milky, and then rolled out into thin strips upon a wet board.

3. *Lemming's method* consists in either boiling with or filtering the hot alcoholic solution through well burnt and recently heated animal charcoal. When necessary, this operation is repeated until the solution is colorless, when it is filtered through fine silk, and finally through fine filter paper. To insure success, the solution should be in the proportion of about 5 oz. of shellac to 1 qt. of alcohol (rectified spirits of wine).

4. Dr. Hare published a method for bleaching the lac by means of chlorine. He dissolved one part of shell or seed lac in a boiling solution of 1 part of pearlash in about 8 parts of water. The solution was then cooled and impregnated with chlorine gas till the lac was all precipitated. The precipitate thus obtained is white, but the color deepens by washing and consolidation; dissolved in alcohol, lac bleached by this process yields a varnish which is as free from color as any copal varnish. The application of chlorine must be made by a person acquainted with chemistry. Hence chloride of lime is safer as a bleaching agent, the lime being afterward dissolved out from the precipitate by dilute muriatic acid.

5. Shellac (Orange), to Bleach to White.—Rub up with and dissolve in 2 lb. water, 2 lb. chloride of lime. Add to above 4 oz. caustic potash in 1 lb. of water. Digest 2 lb. of the shellac in 1 gal. of alcohol for a few days. Add the above fluid then with constant stirring, and after half an hour add excess of hydrochloric acid. Pour off the fluid after the shellac has separated, wash the shellac with boiling water until the latter comes off clear, place the shellac on a moist board, and dry.

Instructions for Bleaching Silk.—The articles to be bleached must be freed from all mechanically adhering dirt, grease, etc. This is effected, according to the nature of the article, and of the impurities to be removed, by means of soap, ammonia, sulphuret of carbon, ether, or alcohol. These cleansing agents must then be entirely removed, either by washing or by evaporation. A bleach bath is then made up with the peroxide of hydrogen, either alone or along with small traces of ammonia or of soda lye. The silks are simply laid in this liquid, and left to steep as may be required. The process is accelerated by heat not exceeding 77° F., and by the light of the sun. The bleaching process may last from two to fourteen days. When it is completed, the silks are rinsed in condensed steam water, and carefully dried.

In China, silks are scoured with carbonate of potash or of soda, but this method has been nearly abandoned in Europe on account of the amount of care and attention it requires. From 10 to 12 lb. of carbonate of soda are required for 100 lb. of raw silk. The scouring bath is not allowed to get hotter than 185° F., and the process may last from sixty to ninety minutes. The action is considered to have gone far enough when the threads give a kind of crackling sound if rubbed with the finger nail. Two or three washings with lukewarm water complete the process. The loss is rarely below 18%, and may rise to 28%.

Caustic soda is used in very weak solutions for coarse kinds of silk. From 3 to 4 lb. solid caustic is sufficient for 100 lb. silk. It is dissolved in about 300 gal. water at 140°, and the yarns are worked for thirty minutes and are then washed. The loss does not exceed 12%.—*Crookes.*

Bleaching Small Articles.—Articles, as pocket handkerchiefs, require, every few weeks, to get a good "stewing" in a warm oven, often having to be left there, in a good large stewpan, for several days at a time, until they look white. As a preparation for washing, always steep white (not color-printed ones) articles in cold water for a few hours, and then the soiled parts can be very much cleansed by a good pressing together between the hands—no violent rubbing—then use good white soap on them, and let them remain overnight, folded flat in

a dish, not in water, but yet wet enough to completely melt the soap through the texture of the articles. Do not be stingy of soap; you can use the lather with other articles of a less fine sort. A little practice will bring you to the use of enough without waste. Next day pour on to said clothes a kettleful of very clean boiling water—boiling, mind you; for if only one degree below the boiling point, it will not be hot enough to whiten them. Cover your washing mug (or basin) at once, so that the steam is kept in; after twenty to thirty minutes has passed, wash your things, and give them a rinse in plenty of tepid water. If now they are not to your satisfaction, spread them, well pulled out, while wet, upon a large dish, which place at or outside an open, sunny window, sprinkle them with clean cold water several times a day, and they will bleach lovely. Keep this going for two or three days; then wash again in a clean "scald," as above described, and when you have them finished it will be your own fault if your laces and handkerchiefs are not a wonder to all beholders. Never starch your lace articles, but crisp them in cold water, in which two or three lumps of loaf sugar are dissolved; also, be sure to stretch out the work while wet, then dry flat on a towel upon the bed.

Sponges, to Bleach.—1. As is well known, chlorine and its compounds cannot be used for bleaching sponges, as they impart a yellow color to the latter, which in addition become hard and lose their fine texture. The method now generally employed is a water solution of sulphurous acid, and requires from six to eight days, and considerable manipulation. According to the latest researches made in Germany, the bleaching of sponges can be performed more conveniently and expeditiously by means of bromine dissolved in water. As is well known, 1 part of bromine requires 30 parts of water to dissolve it, and thus a concentrated solution can easily be obtained by dropping a few drops of the former into a bottle of distilled water and shaking it. The sponges are submerged in this solution, and after the lapse of a few hours their brown color changes to a lighter one, the dark red bromine solution changing at the same time to light yellow. By treating the sponges to a second immersion of a fresh solution, they acquire the desired light color in a short time. They are improved still more if finally dipped in dilute sulphuric acid and washed with cold water. It seems strange that such closely allied bodies as chlorine and bromine should act so differently toward the coloring matter in sponges.

2. Saturate in 1 qt. of buttermilk for twenty-four hours, and rub between the hands.

3. Soak in dilute muriatic acid (1 part acid to 1½ parts water) for twelve hours, wash well with water to remove lime, then immerse it in a solution of 2 lb. hyposulphite of soda in 12 lb. water to which 2 lb. muriatic acid has been added a moment before. After it is sufficiently bleached, remove, wash again, and dry.

4. Soak for several days in cold water, renewing the water and squeezing the sponges occasionally. Then wash in warm water, and put into cold water acidulated with hydrochloric acid. Next dry, take out, and wash thoroughly in soft water; then immerse in an aqueous sulphurous acid (sp. gr. 1·034) for a week. Afterward wash in plenty of water, squeeze, and allow to dry in the air.

5. Soak in dilute hydrochloric acid to remove the lime, then wash in water, and place for ten minutes in a 2% solution of potassium permanganate. Their brown appearance on removal from this is due to deposition of manganous oxide, which may be removed by steeping for about two minutes in a 3% solution of oxalic acid to which a little sulphuric acid has been added. As soon as the sponges appear white, they are washed out in water to remove the acid. Very dilute sulphuric acid may replace the oxalic acid.

6. First wash in tepid water, and then in a solution of hydrochloric acid (5 c. c. per liter=5 fl. drm. per 7 pt.), which frees the pores from carbonate of lime; next immerse for twenty-four hours in a solution composed of 5 pt. hydrochloric acid in 100 pt. of water, with addition of 6 pt. hyposulphite of soda.—*Blondeau.*

Straw, to Bleach.—1. The articles, having been washed as below, may be placed for an hour in weak chloride of lime water, and then hung out on a line to dry slowly. The chloride of lime water should be made by mixing 1 part (by weight) of chloride of lime with 20 parts of water, agitating the mixture with a stick until all the particles of chloride of lime are thoroughly broken up, allowing the mixture to settle, and pouring off the clear portion from the dregs for use.

2. On a small scale, with such an article as a straw hat, a bonnet, a basket, etc., the following method may be followed: The straw, having been well washed with weak soda lye, is rinsed in plenty of clean water, lightly shaken, etc.; remove superfluous moisture, and place, supported on a stick, under a large glazed earthenware pan turned upside down. A very small pipkin, capable of holding about ½ pt., is now placed on the fire, and about ½ oz. of roll brimstone placed in it. When the brimstone is all melted, a light is applied to it, so as to cause it to catch fire. The pipkin, with the inflamed sulphur, is now placed under the glazed pan in such a position as not to scorch the article to be bleached. The spaces between the pan and the table or floor on which it rests must be carefully closed with damp cloths placed around to prevent the escape of the sulphurous acid gas produced by the combustion of the sulphur. In about two hours the pan may be removed, when the straw will be found nicely bleached.

Starch.—Potato starch is largely bleached by the application of sulphuric acid, this being absolutely requisite when the potatoes are at all decayed. After the use of the sulphuric acid, any remaining traces of acid must be neutralized by ammonia or milk of lime, fixed caustic alkalies being inadmissible. Chlorine is also much used for bleaching starch, usually as a solution of calcium chloride in water soured by the addition of sulphuric acid; this and some other salts cause the grains to swell, and render them soluble in cold water. Sal ammoniac is another favorite agent.—*Spons' Encyclopedia.*

Tallow, to Bleach and Harden.—In a copper boiler put ¼ gal. water and 100 lb. rendered tallow; melt over a slow fire, and add, while stirring, 1 lb. of oil of vitriol, previously diluted with 12 lb. of water; afterward, ½ lb. bichromate of potassa, in powder; and lastly, 13 pt. water, after which the fire is suffered to go down, when the tallow will collect on the surface of the dark green liquid, from which it is separated. It is then of a fine white, slightly greenish color, and possesses a considerable degree of hardness.

Composition for Cleansing and Bleaching Textile Fabrics, Paint, Floors, Casks, etc.—1. Carbonate of potash, 22 parts; sand free from alumina and iron, 50 parts; charcoal, 2 parts.

2. Carbonate of soda, 22 parts; carbonate of potash, 70 parts; silicate of potash, 20 parts; charcoal, 1 part.

3. Silica, 1 part; common salt, 2 parts.—*Science Record*, 1875.

Wax.—Melt the wax in a jar, and put into it powdered nitrate of soda, in the proportion of 1 oz. to 1 lb. of wax. Afterward add by degrees 2 oz. to 1 lb. of sulphuric acid, diluting with ten times its weight of water, keeping the wax warm and stirring the while. Let it stand a short time, and then fill up the jar with hot water, and allow the whole to cool. The wax should then be white. Afterward wash with water to remove any nitric acid that may remain, as it would make the wax yellow.

Wood, to Bleach.—In most cases the staining of wood may be effected so as to produce very bright colors without any previous preparation, as, generally speaking, the mordants employed have a bleaching action on the wood. But in many cases, in consequence of the quality of the wood under treatment, it must be freed from its natural colors by a preliminary bleaching process. To this end it is saturated as completely as possible with a clear solution of 17¼ oz. chloride of lime and 2 oz. soda crystals in 10½ pt. of water. In this liquid the wood is steeped for half an hour, if it does not appear to injure its texture. After this bleaching it is immersed in a solution of sulphurous acid to remove all traces of chlorine, and then washed in pure water. The sulphurous acid which may cling to the wood in spite of washing does not appear to injure it, or alter the colors which are applied.

Bleeding, to Arrest. See **Styptics.**

Blisters.—When arising from friction or other irritation, they should be pricked with a needle, and emptied of their contents by pressure; but the skin should on no account be broken.

The following preparation may then be gently rubbed into the part: Spermaceti, 1 part; olive oil, 1 part; subnitrate of bismuth, 1 part. The part *must* be protected from friction, or a disagreeable sore will probably result. This is especially necessary when the blister is situated on the heel. One method of protecting it in this situation is to first place over it a piece of court plaster, and over this a good thick piece of cotton wool, at least twice the size of the blister; this should be kept on by strips of adhesive strapping.

Another plan is to thickly spread a small piece of lint with the preparation recommended, to place this over the blister, and over this cotton wool.

Blisters. See **Photography.**

Bloom of Roses. See **Rouges and Face Paints.**

Blotters, Substitute for.—14 parts by weight gypsum, 2 parts potato flour. Mix and pour into a mould. When this mass becomes hard, the blotter is ready for use.

Bluing for Laundry Use.—1. Dissolve indigo sulphate in cold water and filter.

2. Dissolve good cotton blue (aniline blue 6 B) in cold water.

3. Dissolve fine Prussian or Berlin blue with ⅛ part of oxalic acid in water; or use ferrocyanide of potassium (⅛ part) in place of oxalic acid.

4. Dissolve 7 oz. of yellow prussiate of potash in 2·1 pints of water. Make a solution of sesquichloride of iron which shall contain 1 part of the solid salt by weight to every 10 parts of water by weight. Take equal volumes of the two solutions, and add to each twice its volume of cold concentrated solution of sulphate of soda. Finally, mix the two solutions thus obtained. The solid Prussian blue will immediately precipitate. This may be put upon a filter and washed, being kept exposed to the air for perhaps fifteen or twenty days. The excess of soluble salts will first be washed away, and then the latter washings will dissolve the blue, forming a deep-blue liquid, which may be used for preparations of bluing for clothing. It is, however, better to buy the soft Prussian blue than to attempt to prepare it on a small scale. 1 oz. of the soft Prussian blue powdered, and put into a bottle with 1 qt. of clear rain water, acidulated by ¼ of an oz. of oxalic acid, is a good preparation. A very small portion suffices for a large amount of clothing.

5. *A Disinfective Laundry Blue.*—Mix together 16 parts of Prussian blue, 2 parts of carbolic acid, 1 part of borax, and 1 part of gum arabic into a stiff dough. Roll it out into balls as large as hazel nuts, and coat them with gelatine or gum, to prevent the carbolic acid from escaping.

6. *Liquid Washing Blue.*—Water 15 parts; dissolve in this 1½ parts indigo-carmine. Add ¾ part gum arabic.

Blue Pigments. See **Pigments. Blue Prints.** See **Photography.**

Bluing Metals.—*Blue Finish, without Heat.*—Clean every part carefully, and apply nitric acid 1 part, diluted with 10 parts of water until a blue film is produced on the surface. Then wash with warm water, dry and wipe with linseed oil.

Brass, to Color Blue like Steel.—The brass laid in a leaden vessel, containing hydrochloric acid and a little arsenic acid, assumes iridescent tints, and may be removed when the desired shade of blue is obtained.

Bluing Gun Barrels.—1. For bluing gun barrels by staining dissolve 4½ oz. hyosulphite of soda in 1 qt. water, also 1¼ oz. acetate of lead in 1 qt. water. Mix the two solutions and bring to a boil in a porcelain dish or stone pot. Clean the gun barrel free from grease, oil, or varnish, warm the barrel and smear with the hot solution, using a piece of sponge tied to a stick. When color develops wash and wipe dry, finish with boiled linseed oil.

2. The bluing of gun barrels is effected by heating evenly in a muffle until the desired blue color is raised, the barrel being first made clean and bright with emery cloth, leaving no marks of grease or dirt upon the metal when the bluing takes place, and then allow to cool in the air. It requires considerable experience to obtain an even, clear blue.

How to Blue a Revolver.—3. Sometimes the steel is heated to a light gray color, allowed to cool and reheated until blue. 1. Get as high a polish as possible on the part which you want to blue. 2. Get an iron box made (thin sheet iron). If for the chamber only, say about 6 in. square, no need for rivets, just doubled together. 3. Pound up some wood charcoal; fill your box with it; put the box on a fire (any fire); stir up the charcoal now and again, till you find it is partly ignited. Now put your chamber into the box of partly ignited charcoal; put it in about midway, so as to have as much heat at bottom as at top and sides. 4. Have handy a handful of dry powdered lime and a piece of tow or cotton waste; you will want a small pair of tongs, or other means of lifting your article out of the box. When you put the article in the box place it again on the fire. Now you must pay attention to it; lift it out about every ten minutes and don't stand looking at it, but at once rub it with the tow dipped in the lime. As quickly as possible put back into the charcoal. Don't let your charcoal get too hot; when you see it getting very hot lift the box off the fire and stand it in any convenient spot; replace on fire again if necessary. Now, the following is important: Your chamber in a short time gets of a purple color, then bright blue. It is very tempting to leave off at this bright blue. Don't. This first blue is no good, at least no good where the article has to be rubbed and cleaned. Continue, the bright blue will depart, leaving your chamber nearly as before you put it in the box. Don't forget every seven or ten minutes to take out the article and rub it with the tow and dry lime. It must not be kept long in the air. Presently you should obtain a rich, dark blue. Finally, when blued, let it cool, then oil (any oil).—*English Mechanic.*

Steel, Bluing of.—1. Try the following: Scour the steel with a small quantity of a strong aqueous solution of soda, rinse in water, warm, and brush over with a solution of ¼ of an oz. chloride of iron, dissolved in 5 oz. of water, and let it dry; then apply in the same manner a solution of 1-5 of an oz. pyrogallic acid in 1 oz. water, dry, and brush. Does not wear well without lacquering. The blue oxide is sometimes imitated

by using a thin alcoholic shellac varnish, colored with aniline blue or Prussian blue.

2. The articles to be blued should have their surfaces cleaned and polished. They may be then heated in fine clean wood ashes to a temperature of from 500° to 600°, according to the depth of the color required. It is not necessary to watch the temperature, but simply to examine the articles from time to time to see that when cooled in the air they assume the proper color. They should then be immediately removed, and the operation is then completed.

3. To blue steel without heat, mix finely powdered Prussian blue with rather thin shellac; gently heat the steel and apply the varnish.

4. Iron and Steel to Blue without Heat. Solution of potassium ferricyanide and water, 1:200; solution of ferric chloride, 1:200. Mix the two solutions and dip.

5. Antimony trichloride, 25 parts; nitric acid, fuming, 25 parts; and hydrochloric acid, 50 parts. Apply with a rag and rub until the proper color is obtained with a piece of green oak.

Bobierre's Metal. See **Alloys.**

Boiler Covering.—The following table gives the results of a series of experiments by Mr. C. E. Emery, for the New York Steam Company:

Material.	Non-conductivity.
Hair felt	100%
Mineral wool No. 2	83·2%
Mineral wool No. 2 and tar	71%
Sawdust	68%
Mineral wool No. 1	67·6%
Charcoal	63·2%
Pinewood, across grain	55·3%
Loam	55%
Gasworks lime, slaked	48%
Asbestos	36·3%
Coal ashes	34·5%
Fuel coke	27·7%
Air space, 2 in. deep	13·6%

Non-conducting Coverings for Steam Pipes.—We give following tests of Mr. G. B. Dumford, of Hamilton, Ont. These may be found superior in some cases to tests of Mr. C. E. Emery, in the *Scientific American:*

Combination of asbestos, hair felt, air space and wood	100%
Asbestos and hair felt and chopped straw, the straw mixed with lime putty	87%
A plastic cement manufactured by parties at Troy, N. Y., with ½ in. hair felt outside	86·6%
Paper pulp mixed with lime putty, 1 in. covered with sheeting of wood pulp	85%
Mineral wool cased with wood	81%
" " cased with sheet iron	79%
Charcoal	60%
Sawdust	41%
Loam and chopped straw sealed with wood	32%
Asbestos	29%
Coal ashes	24%
Air space	20%
Fire brick	15%
Red brick	12%
Sand	9·3%

Boiler Incrustations. See **Incrustations.**

Boilers, Paint for. See **Paints.**

Boilers, to Preserve, when not in Use.—To lay up a portable boiler out of use, blow out or otherwise empty the water from the boiler thoroughly while the iron is warm, so it will dry off inside. Take off a hand-hole plate, and (if no man-hole plate) take out the safety valve, so as to permit a circulation of air through the interior. Take out the grate bars, and thoroughly clean off the ashes and soot from all parts of the furnace walls and the interior of the tubes. Store the boiler in a dry shed or barn, with the chimney stack standing, or in a dry place with an umbrella hood over the top of the stack, so that dry air will draw through the furnace and tubes.

Boilers, Steam, Rules for Management of.—Engineers and users of steam power will be benefited by keeping in constant mind the following rules which the Hartford Steam Boiler Insurance Company keep posted in the boiler rooms where they have assured risks:

1. Condition of the Water.—The first duty of an engineer when he enters his boiler room in the morning is to ascertain how many gauges of water there are in his boilers. Never unbank nor replenish the fire until this is done. Accidents have occurred and many boilers have been entirely ruined from neglect of this precaution.

2. Low Water.—In case of low water, immediately cover the fire with ashes; or, if no ashes are at hand, use fresh coal. Do not turn on the feed under any circumstances, nor tamper with nor open the safety valve. Let the steam outlets remain as they are.

3. In Case of Foaming.—Close the throttle, and keep closed long enough to show true level of water. If that level is sufficiently high, feeding and blowing will usually suffice to correct the evil. In case of violent foamings, caused by dirty water, or change from salt to fresh, or *vice versa*, in addition to the action above stated, check draught and cover fires with fresh coal.

4. Leaks.—When leaks are discovered, they should be repaired as soon as possible.

5. Blowing Off.—Blow down, under a pressure not exceeding 20 lb., at least once in two weeks; every Saturday night would be better. In case the feed becomes muddy, blow out 6 or 8 in. every day. Where surface blow cocks are used, they should be often opened for a few moments at a time.

6. Filling up the Boiler.—After blowing down, allow the boiler to become cool, before filling up again. Cold water pumped into hot boilers is very injurious, from sudden contraction.

7. Exterior of Boiler.—Care should be taken that no water comes in contact with the exterior of the boiler, either from leaky joints or other causes.

8. Removing Deposit and Sediment.—In tubular boilers the hand holes should be often opened, and all collections removed from over the fire. Also, when boilers are fed in front, and blown off through the same pipe, the collection of mud or sediment in the rear end should be often removed.

9. Safety Valves.—Raise the safety valves cautiously and frequently, as they are liable to become fast in their seats and useless for the purpose intended.

10. Safety Valve and Pressure Gauge.—Should the gauge at any time indicate the limit of pressure allowed by this company, see that the safety valves are blowing off. In case of difference, notify the company's inspector.

11. Gauge Cocks, Glass Gauges.—Keep gauge cocks clear and in constant use. Glass gauges should not be relied on altogether.

12. Blisters.—When a blister appears, there must be no delay in having it carefully examined and trimmed, or patched, as the case may require.

13. Clean Sheets.—Particular care should be taken to keep sheets and parts of boilers exposed to the fire perfectly clean; also, all tubes, flues and connections well swept. This is particularly necessary where wood or soft coal is used as fuel.

14. General Care of Boilers and Connections.—Under all circumstances keep the gauges, cocks, etc., clean and in good order, and things generally in and about the engine and boiler room in a neat condition.

Boilers, Rules for Strength of.—To find the safe pressure a cylindrical boiler will bear in pounds per square inch: Divide the thickness of the plate in inches by the diameter of the boiler in inches, and multiply the quotient by 5,000 for a

copper boiler with single riveted shell; by 6,400 for a copper boiler with double riveted shell; by 7,600 for a wrought iron boiler with single riveted shell; by 9,000 for a wrought iron boiler double riveted; by 10,000 for a steel boiler single riveted; by 12,000 for a steel boiler double riveted.

Boiling Points. See **Temperature, Effects of.**

Boils.—1. If the inflammation is very great, poultices may be applied for a few hours. At the same time internal medicines are plainly indicated. Indolent boils may be covered once daily with glycerine, 1 drm.; extract of conium, 1 drm.; extract of belladonna, 1 drm.; made into an ointment with 1 oz. of ceratum resinæ. A druggist should prepare this. In very chronic cases the boil may be painted with iodine tincture once daily.

2. The exciting cause should receive attention. Boils are often due to general debility or an impoverished state of the blood. Iron, quinine, and the potassium salts have been found in such cases, used either alone or combined, most advantageous. For local application, strong carbolic acid will arrest the pain and relieve all irritability. Naphthol ointment, balsam of Peru, or a strong solution of the mercurial corrosive chloride can be used with great benefit to the parts.—*Phila. Bulletin.*

Bole.—The name of several argillaceous minerals, varying in color from white to yellow, red, and brown, which they owe chiefly to iron.

Bone, to Polish. See **Polishing.**

Bones, to Clean and Prepare. See **Cleansing.**

Bones, to Utilize.—The following plan has been suggested for utilizing bones: Place them in a large kettle filled with ashes, with about 1 peck of lime to 1 barrel of bones. Cover with water and boil. After twenty-four hours nearly all the bones will be soft enough to be pulverized by hand. The rest may have to be boiled ten or twelve hours longer. When pulverized they will be in the form of paste, and suitable to mix with other manure.

Bookbinders' Lacquer. See **Lacquers.**

Bookbinders' Varnish. See **Varnishes.**

Book Edges, to Polish. See **Polishing.**

Books, to Clean. See **Cleansing.**

Books, to Gild. See **Gilding.**

Books, to Repair.—The first thing is to secure the loose leaves. Odd leaves can be fixed in with paste or thin glue. If a whole section is loose, first sew it with stout thread, leaving long ends at the back, and then tie these ends to the part that goes before and the part that follows. A sheet of paper glued on the back will fix it in its place, letting a little glue go in before and after the sewed section. If the book has slipped out of the cover, leaving the cover intact, the best way is to strip all the paper off the back (not sides) of the cover, leaving the cloth (or leather, as the case may be) bare; then glue the back of the quires, and stick them on the cloth. This, with or without new end papers, will complete the job. This makes what is called a tight back; but it will open fairly well if all the padding is taken out, as directed above, and will make a strong binding. If only one cover is torn off, it can be fastened on thus: Raise the leather of the cover from the millboard with a penknife to the depth of ½ in. (or less if book is small). Get a piece of cloth, about 1 in. wide, and glue this into the opening made; do the same with the back of the book, and put in the remaining ½ in. of cloth with glue, and the job is done. They are not handsome, but are always strong.

Books, Sizes of.—The associated librarians of Great Britain recently fixed upon the following scale of measurements for the sizes of books. The inferior limit of each size being the superior limit of the size below it:

Large folio.....	la. fo	.....over	18 in.
Folio	fo	.....below	18 in.
Small folio...	....sm. fo	..... "	13 in.
Large octavo.	...la. 8o	..... "	11 in.
Octavo.....	.... 8o	..... "	9 in.
Small octavo....	.sm. 8o	.....	
Duodecimo.....	12o	..... "	8 in.
Decimo octavo...	18o	..... is	6 in.
Minimo....	... mo	..... below	6 in.
Large quarto ..	la. 4o	..... "	15 in.
Quarto.....	4o	..... "	11 in.
Small quarto.....	sm. 4o	..... "	8 in.

To designate unusual sizes the additional terms square, sq., narrow, nar., and oblong, ob., are to be used.

Boots, Blacking for. See **Blacking.** Also **Shoes.**

Boot Powders. See **Powders.**

Boots, Squeaky.—A journal suggests their cure by the injection of powdered French chalk through a perforation in the inner sole, and adds that the free use of the same substance between soles when boots are being made will effectually prevent any trouble of this nature.

Boot-top Liquid.—1. Solution of muriate of tin 3 drm., French chalk, or Venetian talc, in powder 1 oz., potassium binoxalate ½ oz., flake white 1 oz., burnt alum ½ oz., powdered cuttle fish bone 1 oz., white arsenic 1 oz., boiling water 1 qt. Probably sulphate of barytes might be substituted for arsenic, the use of which it is desirable to discourage.

2. Sour milk 3 pt., cream of tartar 2 oz., oxalic acid 1 oz., and alum 1 oz.

3. Wash the tops with soap and water, and scrape them with the back of a knife. Then apply the following with a hair foot brush: Oxalic acid 1 oz., water 1 pt.; use the back of a knife as before; then polish with the following: Powdered gum arabic ½ oz., red spirits of lavender 2 oz., powdered turmeric ½ oz.; pencil this over the top, let it half dry, then polish by rubbing it, one way only, with a flannel till it shines.

4. Sour milk 3 pt., butter of antimony 2 oz., cream of tartar 2 oz., citric acid, alum, burnt alum, of each 1 oz.

5. White top: 1 oz. each of magnesia, alum, cream of tartar and oxalic acid, ¼ oz. potassium binoxalate, and ¼ oz. sugar of lead; dissolve in 1 qt. of water, and apply with a sponge.

6. Brown top: Oxalic acid, alum, annatto, of each 1 oz., isinglass ½ oz., sugar of lead ½ oz., salt of sorrel ¼ oz.; boil together in 1 qt. of water for ten minutes. Apply with a sponge.

Boots, Varnish for. See **Varnishes.**

Borax, Substitute for.—Copperas 2 oz., saltpeter 1 oz., common salt 6 oz., black oxide manganese 1 oz., prussiate of potash 1 oz., all pulverized and mixed with 3 lb. nice welding sand. Use the same as you would sand. High tempered steel can be welded with this at a lower heat than is required for borax.

Bottle Caps, Varnish for. See **Varnishes.**

Bottle Cements. See **Cements.**

Bottle Wax. See **Waxes.**

Bottles, to Cleanse. See **Cleansing.**

Bottles, to Label.—1. By etching: Barium sulphate, 3 oz.; ammonium fluoride, 1 oz.; to which add sufficient sulphuric acid to decompose the ammonium fluoride and make the mixture semi-fluid. The ink must be prepared in a leaden dish and kept in a lead or gutta percha bottle. It is applied to the glass with a camel's hair brush or quill pen, and when sufficiently etched the granulated letters should be filled in with some white or black pigment.

2. The sand blast and other mechanical engraving methods are altogether out of the question for any but professional glass cutters. Nor can the letters be cut very satisfactorily and legibly with a diamond. We have, then, nothing left but paper labels, and, as an adhesive preparation for such, experiment has shown the following formula to be about the best: Gum arabic, 1 oz.; gum tragacanth (pulv.), 1 oz.; acetic acid, 40 min.; glycerine, 1 oz.; water, 2 oz. Dissolve the gums in the water, hot; then add the acid and glycerine. The next difficulty as regards paper labels is the fugitive qualities of ordinary writing ink. A bottle labeled nitric acid, with a good bold black ink, may, in a few hours, bear nothing but a label with a few yellow stains upon it to denote its contents.

3. The following, then, will be found to be a good non-corrosive ink and as near indestructible as writing fluids can be made: Oil of lavender, 1 oz.; powdered copal, 1 drm.; lampblack, 6 gr.; indigo, 2 gr. Dissolve the copal in the oil by gently heating, then add the lampblack and indigo. Coat both label and upon the glass surrounding it two or three times with the following varnish, by means of a camel's hair brush, first sizing the label with a solution of isinglass in water: Canada balsam, 1 oz.; spirits of turpentine, 2 oz.

4. Affix a common paper label and let it dry; then heat the label (by a Bunsen burner or very small flame) till it will just melt paraffine rubbed on it. The label is absolutely protected, and looks as if it were enameled on the glass. If the neck and lip of the bottle and the stopper are similarly treated, a perfect air-tight joint is secured and the stopper never sets, while liquids can be poured out without running down the sides.

Bottles, Glass, to Cut. See **Glass.**

Bottles, Show. See **Show Bottles.**

Bouquet. See **Perfumes.**

Bows, Violin, to Clean. See **Cleansing.**

Bows, Violin, Resin for.—1. For violin resin boil down Venice turpentine with a little water until a drop cooled on a piece of glass is of proper consistency. During the boiling cold water must be added from time to time. When sufficiently thick pour into cold water, knead well, and when cold break into pieces. Expose to sun until dry and transparent.

2. Select the best clear brown resin, melt it in a clean basin, to nearly a boil, which will clear it of turpentine or other volatile oils. Pour in paper moulds.

Branding Ink. See **Inks.**

Brandy. See **Liquors.**

Brandy Smash.—1. 1 tablespoon water, ½ tablespoon of white sugar, 1 wine glass brandy. Fill the tumbler ¾ full shaved ice, put in 2 sprigs of mint. Put 2 small pieces of orange on top.

2. A small lump of sugar, 1 tablespoonful of cold water, and 1 wine glass of brandy. Fill ¾ full shaved ice, use 2 sprigs of mint. Lay 2 small pieces of orange on top, and ornament with berries in season.

Brass Compositions. See **Alloys.**

Brass, to Black. See **Blacking Metals.**

Brass, to Blue. See **Bluing.**

Brass, to Bronze. See **Bronzing.**

Brass, to Clean. See **Cleansing.**

Brass, Coloring and Finishing of. See also **Bronzing.**

Bronze, Barbédienne, on Brass.—Freshly precipitated arsenious sulphide is dissolved in ammonia, and antimonious sulphide is added until a dark yellow color is produced. Heat the solution carefully to about 95° F. Leave the articles in the bath until they have acquired a dark brown color, and develop the color by scratch brushing.

Steel Blue on Brass.—Dissolve 3 drm. of antimony sulphide and 4 oz. calcined soda in 1½ pt. of water. To this add 5½ drm. of kermes. Filter, and mix this solution with 5½ drm. of tartar, 11 drm. of sodium hyposulphite, and 1½ pt. water. If polished sheet brass is placed in the warm mixture, it will assume a beautiful steel blue color.

Steel-gray Coating on Brass.—Antimonic sulphide and fine iron filings, 1 part of each; hydrochloric acid, 3 parts; and water 3 or 4 parts.

Green Color on Brass.—The repeated applications, to copper or brass, of alternate washes of dilute acetic acid and exposure to the fumes of ammonia will give a very antique-looking green bronze; but a quick mode of producing a similar appearance is often desirable. To this end the articles may be immersed in a solution of 1 part perchloride of iron in 2 parts water. The tone assumed darkens with the length of immersion. Or the articles may be boiled in a strong solution of nitrate of copper. Or, lastly, they may be immersed in a solution of 2 oz. nitrate of iron and 2 oz. hyposulphite of soda in 1 pt. water. Washing, drying and burnishing complete the process.

Brass, Miscellaneous Colors on.—1. An orange tint inclining to gold is produced by first polishing the brass and then plunging it for a few seconds in a warm neutral solution of crystallized copper acetate. Dipping into a bath of copper, the resulting tint is a grayish green.

2. A beautiful violet is obtained by immersing the metal for an instant in a solution of chloride of antimony and rubbing it with a stick covered with cotton. During this operation the brass should be heated to a degree just tolerable to the touch.

3. A *moiré* appearance, vastly superior to that usually seen, is produced by boiling the object in a solution of sulphate of copper. There are two methods of procuring a black lacquer on the surface of brass. The first, which is usually employed by instrument makers, consists in polishing the object with tripoli and washing it with a mixture composed of nitrate of tin 1 part, chloride of gold 2 parts. Allow this wash to remain for fifteen minutes, then wipe it off with a linen cloth. An excess of acid increases the intensity of the tint. In the second method, copper turnings are dissolved in nitric acid until the latter is saturated; the objects are immersed in the solution, cleaned and subsequently heated moderately over a charcoal fire. This process must be repeated in order to produce a black color, as the first trial only gives a dark green. Finally, polish with olive oil.

4. The following is one of the compositions that turn out a rich color:

Lake copper	1 lb.
Tin	1 oz.
Zinc	½ oz.
Lead	½ oz.

Time, seven to twenty minutes, according to thickness of castings.

5. The fifth method is done with chloride of platinum. For this purpose they are first heated to redness, and then dipped in a weak solution of sulphuric acid. Afterward they are immersed in dilute nitric acid, thoroughly washed in water and dried in sawdust. To effect a uniformity in the color, they are plunged in a bath consisting of 2 parts nitric acid and 1 part rain water, where they are suffered to remain for several minutes. Should the color not be free from spots and patches, the operations must be repeated until the desired effect is produced.—*Eng. Mechan.*

6. Copper or brass may be bronzed in various modes. The repeated applications of alternate washes of dilute acetic acid and exposure to the fumes of ammonia will give a very antique-looking green bronze; but a quick mode of producing a similar appearance is often desirable.

To this end the articles may be immersed in a solution of 1 part perchloride of iron in 2 parts of water. The tone assumed darkens with the length of immersion.

7. The articles may be boiled in a strong solution of nitrate of copper.

8. Lastly, they may be immersed in a solution of 2 oz. nitrate of iron and 2 oz. hyposulphite of soda in a pt. of water. Washing, drying, and brushing complete the process.

9. The best means for producing a black surface on brass, pinchbeck, or silver is said to be platinum chloride, which is allowed to liquefy by exposure to the air. It is rubbed in with the finger, or, best, with the ball of the thumb. After blacking, the object is washed and polished with oil and leather. Platinum chloride is dear, but a little of it will do a great deal of work.

10. Ordinary gas fittings are pickled; but if you want to get a good bronze, you can use either a solution of nitrate of silver or bichloride of platinum. The articles will require black-leading after being bronzed, and should be warmed before being dipped into the bronzing solution.

11. A solution of nitro-muriate of platinum will blacken brass quicker than anything else; but possibly 2 oz. corrosive sublimate dissolved in 1 qt. of vinegar will act quickly enough. This solution is brushed over the brass, allowed to remain till the latter is black; it is then wiped off, and the brass cleaned and blackleaded.

12. A very good black varnish may be made by mixing a small quantity of pure lampblack with rather thick brass lacquer, using as little lampblack as possible. Another varnish may be made by fusing 3 lb. asphaltum, and when melted add ½ lb. shellac and 1 gal. oil of turpentine.

13. If merely wanted to black it, brush on a mixture of best vegetable black and French polish. This will give a nice dead black, or modify the deadness by the addition of polish.

14. Make a strong solution of nitrate of silver in one dish and of nitrate of copper in another. Mix the two together, and plunge the brass into the mixture. Remove and heat the brass evenly until the required degree of dead blackness is obtained.

15. Finely powder a small quantity of sal ammoniac and moisten with soft water. Heat the article to be colored over a charcoal fire and rub over with this mixture; then dry with bran and whiting.

16. Wash the brasswork with roach alum dissolved by boiling in strong lye in the proportion of 1 oz. alum to 1 pt. lye, and when dry rub with fine tripoli. Either of these processes will give to brass the appearance and brilliancy of gold. Many receipts for coloring brass will be found under **Bronzing.**

Brass, Polished, Colors for.—Mr. E. Ebermeyer has just published in the *Zeitschrift fur der Chemie Indust.* formulas for a number of baths, designed to give polished brass various colors. The brass objects are put into boiling solutions composed of different salts, and the intensity of the shade obtained is dependent upon the duration of the immersion.

1. With a solution composed of sulphate of copper 120 grn., hydrochlorate of ammonia 30 grn., water 1 qt., greenish shades are obtained.

2. With the following solution all the shades of brown from orange brown to cinnamon are obtained: Chlorate of potash 150 grn., sulphate of copper 150 grn., water 1 qt.

3. The following solution gives the brass first a rosy tint and then colors it violet and blue: Sulphate of copper 435 grn., hyposulphite of soda 300 grn., cream of tartar 150 grn., water 1 pt.

4. Upon adding to the last solution ammoniacal sulph. of iron 300 grn., hyposulphite of soda 300 grn., there are obtained, according to the duration of the immersion, yellowish, orange, rosy, then bluish shades. Upon polarizing the ebullition, the blue tint gives way to yellow, and finally to a pretty gray. Silver, under the same circumstances, becomes very beautifully colored.

5. After a long ebullition in the following solution we obtain a yellow brown shade, and then a remarkable fire red: Chlorate of potash 75 grn., carbonate of nickel 30 grn., salt of nickel 75 grn., water 10 oz.

6. The following solution gives a beautiful dark brown color: Chlorate of potash 75 grn., salt of nickel 150 grn., water 10 oz.

7. The following gives, in the first place, a red, which passes to blue, then to pale lilac, and finally to white: Orpiment 75 grn., crystallized sal soda 150 grn., water 10 oz.

8. The following gives a yellow brown: Salt of nickel 75 grn., sulphate of copper 75 grn., chlorate of potash 75 grn., water 10 oz.

9. On mixing the following solutions, sulphur separates and the brass becomes covered with iridescent crystallizations: I.—Cream of tartar 75 grn., sulphate of copper 75 grn., water 10 oz. II.—Hyposulphite of soda 225 grn., water 5 oz.

10. Upon leaving the brass objects immersed in the following mixture, contained in corked vessels, they at length acquire a very beautiful blue color: Hepar of sulphur 15 grn., ammonia 75 grn., water 4 oz.

11. *Brass, to Cover with Beautiful Luster Colors.*—Mr. Puscher communicates a process by which this much desired end may be easily attained. 1 oz. of cream of tartar is dissolved in 1 qt. hot water, to which is added ½ oz. tin salt (protochloride of tin) dissolved in 4 oz. cold water. The whole is then heated to boiling, the clear solution decanted from a trifling precipitate, and poured under continual stirring into a solution of 3 oz. hyposulphite of soda in ½ pt. water, whereupon it is again heated to boiling, and filtered from the separated sulphur. This solution produces on brass the various luster colors, depending on the length of time which the articles are allowed to remain in it. The colors at first will be light to dark gold yellow, passing through all the tints of red to an iridescent brown. A similar series of colors is produced by sulphide of copper and lead, which, however, are not remarkable for their stability; whether this defect will be obviated by the use of the tin solution, experience and time alone can show.

12. *Brass, Dip for.*—A good "dip" for cast brass is sulphuric acid, 1 qt.; nitric acid, 1 qt.; water, 1 qt. Gold lacquer for undipped brass is alcohol, 4 gal.; turmeric, 3 lb.; gamboge, 3 oz.; sandarac, 7 lb.; shellac, 1½ lb.; turpentine varnish, 1 pt. Green bronze dip is wine vinegar, 2 qt.; verditer green, 2 oz.; sal ammoniac, 1 oz.; salt, 2 oz.; alum, ½ oz.; French berries, 8 oz.; boil together.

Curling.—This fine finish is often seen on fine optical brass work. Remove all scratches and give a high polish by using files, emery paper, Ayr stone, and at last fine rotten stone. Keep wet with water and produce the curling with the aid of a pointed stick of charcoal. The motion should be circular.

Dipping and Pickling Brass.—It is preferable to employ at first a weak liquid containing salts of copper and zinc from previous operations, and termed pickle, which slowly removes the surface coating and leaves the metal smooth. Dilute sulphuric acid is also used as a pickle for sheet copper, being slower and more uniform in its action in proportion to the degree of dilution. Nitric acid, which is the chief constituent of aquafortis, exerts a more powerfully solvent action on zinc than on copper, so that the surface of dipped brass assumes a warmer tone, shading more or less into a reddish yellow. To some extent the color may be varied by using aquafortis of different strengths, probably depending on the component metals being dissolved in different ratios by acids of varying densities. Nitric acid, containing a certain quantity of nitrous acid, is capable of producing different shades of color.

To obtain such a mixture small quantities of organic substances are used for the purpose of generating nitrous fumes, by the action of concentrated nitric acid upon them. Thus sawdust added to strong nitric acid imparts an orange yellow color, due to the partial decomposition of the acid and the formation of *nitrous* acid. Dead dipping is the name applied to the process of producing a dead yellow surface on brass work by dipping in suitable liquids. The work is first pickled in dilute or spent acid until the scale can be removed by rubbing. It is then well swilled and placed in stronger acid, which acts much more promptly, giving rise to a frothy appearance. This is removed by rinsing the work in water, after which it is dipped in strong nitric acid for a few seconds, washed in water, and then washed in water containing dissolved *argol*, finally being dried in hot sawdust. The argol solution is said to prevent a brownish discoloration, or mottling of the surface, which would otherwise occur. In this last dipping it is important that each article should be dipped separately, and not a number strung together on wire, as is often the case in the former dippings.—*Horns.*

1. *Brass, Gold Dip for.*—Soak in the following before dipping: Caustic potash dissolved in ten times its weight of water.

2. The gold bath is composed of distilled water, 17 pt.; pyrophosphate of soda, 28 oz.; hydrocyanic acid of ⅛ prussic acid, ½ of an oz.; crystallized perchloride of gold, ⅔ oz. The pyrophosphate is dissolved in 16 pts. of water, heated, filtered, and cooled. The filtered solution of the gold chloride is added, and then the hydrocyanic acid, when the whole is raised nearly to the boiling point for use. Before entering the bath the articles should be passed through a solution of water 2½ gals.; nitrate of binoxide of mercury, ⅓ oz.; sulphuric acid, ⅔ oz.

Brass, to Dull.—Take 1 part by weight of iron rust, 1 part white arsenic, and 12 parts hydrochloric acid, mix. Clean the brass thoroughly, and apply with a brush until the color desired is obtained; then oil well, dry, and lacquer.

Brass Finishing by Mottling.—The brass is first polished to the required degree, and, if it is a fine surface, the mottled appearance is imparted by rubbing over it with a gyratory motion a Scotch gray stone moistened with water. If the work is not very fine, a piece of fine emery paper may be used in the same way. If it is coarse, a dead smooth file may be used. Another method is to secure emery cloth or paper to the end of a small round stick, placing the stick in the universal chuck of a lathe, holding the work against it with a light pressure, and moving it along while the lathe revolves.

Brass Finishing.—If the work to be finished is greasy, it should be cleaned by heating and dipping in acidulated water—vinegar and water, or washing soda in water—and then in clear water. The finishing bath may be either nitric acid 2 parts, water 1 part; or 1 part sal ammoniac, 1 part sulphuric acid, 1 part nitric acid, 1 part water; all by measure, and the sal ammoniac to be dissolved in water until a saturated solution is obtained. The articles should not be allowed to remain in the acid more than ten seconds, then taken out, plunged into clear cold water, thence into hot soapy water, and dried in hot sawdust.

Frosting Brasswork.—If old work it should be washed or boiled in potash to remove the lacquer; then pickled in water to which a little nitrous acid has been added. It is now dipped in strong nitrous acid (mind your fingers), washed quickly in hot water, and dried in sawdust. The bright parts should now be burnished. To finish: Heat the work on a stove till it is as hot as you can hold it, and then lacquer. This must be done as soon as possible, or it will tarnish.

Olive Green on Brass.—Copper sulphate, 8 parts; sal ammoniac, 2 parts; water, 100 parts. Boil and leave the articles suspended in it until the proper color is reached.

Patina.—This beautiful color was originally produced by articles being exposed for a long time to the action of the atmosphere. The green color is largely imitated by any of the following methods: 1. Copper carbonate is triturated with sandarac varnish. This affords the cheapest and poorest imitation and is largely used in painting the little iron castings which are so largely sold in Rome for souvenirs.

2. 1 part of copper is dissolved in 2 parts of nitric acid, 15 parts of vinegar and ½ part of ammonium chloride are added. The articles for which brass should be used should be allowed to stand for several days and afterward wiped with linseed oil which is old and gummy.

3. Use a solution of cupric nitrate in which 10 % of salt has been added and when the article is thoroughly dry apply a solution of 20 fl. oz. of vinegar, 1 oz. of ammonium chloride and 2 drm. of oxalic acid. Repeat if necessary, and in the course of a few days the article will be finely colored.

Protecting Brass from Tarnish.—To keep brass from tarnishing, after thoroughly cleaning and removing the last traces of grease by the use of potash and water, the cage or other brass work must be carefully rinsed with water and dried, but in doing it care must be taken not to handle any portion with the bare hand, nor anything else that is greasy. The preservative varnish may be shellac, much diluted with alcohol, or it may be hard oil finish. In either case, the brass should be made pretty warm, and the varnish or shellac put on with a brush in as thin a coat as possible. The proportion of shellac to alcohol is about two ounces of the former to nine ounces of the latter. Sometimes gamboge is used for a coloring matter to make the varnish more yellow, and sometimes dragon's blood.

To Produce a Silver White Coating on Brass.—Cream of tartar, 23 parts; tartar emetic, 2 parts; dissolve in 500 parts hot water; add to this hydrochloric acid, 25 parts; powdered or fine granulated tin, 62½ parts; powdered antimony, 15 parts. Heat to boiling, dip in the articles to be coated. Boil for ½ hour, the brass will have a hard, durable silver white coating.

Violet Color on Brass.—1 lb. 2 oz. of hyposulphite of soda is dissolved in 1 gal. of water. In another gal. of water dissolve 6 oz. of lead acetate (crystallized). Mix the two solutions together and heat from 170° to 180°. Clean the articles thoroughly and leave them in the solution until the proper color is reached.

Brass, to White n.—In 2 gal. of water dissolve 3 lb. cream of tartar, and 4 lb. of very finely divided tin are added. This bath can also be used for copper.

Brass Movements, Polish for.—Spanish whiting is mixed with clear rain water in the proportion of 2 lb. to the gal. Stir and let stand for a few minutes to allow the gritty portion to settle; decant off the water into another vessel and again allow it to stand. The settlings in the second vessel are mixed with jeweler's rouge and used for polishing.

To Roughen Sheet Brass, for Painting with Oil Paint.—Make a pickle of concentrated hydrochloric acid, 1½ parts; concentrated sulphuric acid, 12 parts; water, 12 parts. Place the brass in this pickle and allow it to remain for 12 hours. This gives the brass a moire-like appearance. Remove and wash with water. If it is desired to hasten the process, use a mixture of potassium bichromate and hydrochloric acid or a galvanic battery.

Brass, Etching on. See **Etching.**

Brass, Fluxes for. See **Fluxes.**

Brass, to Gild. See **Gilding.**

Brass, Lacquers for. See **Lacquers.**

Brass, Melting.—The operation is rarely at first accomplished by amateurs without con-

siderable difficulty. It requires a good furnace, capable of fusing copper, and a crucible capable of withstanding the high temperature. For this latter reason black lead crucibles are generally employed. The crucible is placed in the newly made fire, so as to heat up gradually. When well heated, place in your copper in small pieces, and force your fire until the copper is just fluid; then place in your zinc, stirring the fused alloy meanwhile. Do not allow the temperature to rise too high, as in this case a great part of the zinc will be volatilized, and, coming into contact with the air, will become ignited and converted into a copious white vapor of oxide of zinc. It is advisable to keep the surface of the fused metal covered with a quantity of chloride of ammonium (sal ammoniac), in order to preserve the surface free from oxide and clean.

Brass, to Silver. See **Silvering.**

Brass, Solder for. See **Soldering.**

Brasses. See **Alloys.**

Brasses for Bearings. See **Alloys.**

Brassing Iron.—Remove all organic matter from the surface of the iron, and plunge it into melted brass. The coating of brass which is spread over the iron may be polished or burnished.

Brassing by Electricity. See **Electro-Metallurgy.**

Brazil Wood.—A dye stuff furnished by several species of trees of the genus *Cæsalpinia*, and much used in dyeing various shades of red.

Brazing.—*Brazing Aluminum.*—Aluminum bronze will braze as well as any other metal by using ¼ brass solder (copper, 50%, zinc, 50%), and ¾ borax.

Steel, to Braze.—The following solder will braze steel, and may be found very useful in case of a valve stem or other light portion breaking when it is important that the engine should continue to work for some time longer: Silver, 19 parts; copper, 1 part; brass, 2 parts. If practicable, charcoal dust should be strewed over the melted metal of the crucible.

Bread, Aerated.—Divide 3 lb. flour into two portions; mix up the first with water holding in solution 2 oz. bicarbonate of soda; then mix the second portion of flour with water to which 1 oz. of muriatic acid has been added; knead each mass of the dough thoroughly. When this is done, mix both portions together as rapidly and perfectly as possible, form the mass into loaves, and bake immediately. This bread contains no yeast, and is very wholesome. You can, if you prefer, use a baking powder such as the following:

Powdered cream tartar	30 oz.
Bicarbonate of soda	15 "
Flour	6 "

All well dried; mix thoroughly and keep dry.

Breath, Offensive.—Causes: The primary are constitutional, the proximate are an unhealthy state of the mucous membrane of the mouth, gullet and stomach. It is weak and inactive, and its cells are not properly cast off and renewed, the external layers being slowly disintegrated. Another proximate cause is the retention of undigested food in the stomach. Treatment: This, in the main, must be constitutional. The odor may be corrected by washing out the mouth with Condy's fluid, and by taking the following draught twice a day:

Chlorate of potash	15 grn.
Water	1 oz.

Smoker's Breath, etc.—Do not smoke bad tobacco, which leaves an abominable odor about the person and contaminates the breath almost beyond immediate remedying. The same may be said of bad cigars. The following is an old formula for removing the odor of tobacco from the mouth after smoking; it is to be used as a wash:

Calcium chloride	2 drm.
Water	1 oz.

Agitate for half an hour and filter. Then add:

Rectified spirit	1 oz.
Rose water	½ oz.

For sore tongue, the simplest remedy is to wash out the mouth with

Glycerine	1 part.
Powdered chalk	1 part.
Water	8 parts.

This will of course require to be shaken up before using.

Brewer's Cement. See **Cements.**

Brick, New Kind of.—Messrs. Bleininger & Hasselmann, two German chemists, have, it is said, recently patented a method for obtaining products that will be more resisting to humidity, etc., than ordinary bricks and tiles. After drying and grinding the clay, they make a mixture as follows:

Clay	91½ parts.
Iron filings	3 "
Table salt	2 "
Potash	1½ "
Elder or willow wood ashes	2 "

The whole is heated to a temperature varying from 1,850° to 2,000° C. (3,362° to 3,632° F.) At the end of from four to five hours the argillaceous mixture is run into moulds, then rebaked in the ovens (always protected from the air) at a temperature of 842° to 932° F. The product may be variously colored by adding to the above 100 parts: 2 parts of manganese for a violet brown, 1 part of manganese for violet, 1 part of copper ashes for green, 1 part arseniate of cobalt for blue, 2 parts of antimony for yellow, and 1½ parts of arsenic and 1 part of oxide of tin for white. These products resist the action of acids, and are well adapted for sewers, etc.

Bricks, to Stain. See **Staining.**

Brilliantine. See **The Hair.**

Bristles, to Bleach. See **Bleaching.**

Bristles, to Dye. See **Dyeing.**

Bristles, to Stiffen.—Immerse the bristles for a short time in cold alum water.

Britannia, to Clean. See **Cleansing.**

Britannia Metal. See **Alloys.**

Britannia Metal, Solder for. See **Soldering.**

Broadcloth, to Clean. See **Cleansing.**

Bronze. See **Alloys.**

Bronze Casting.—Bronze is generally supposed to be a mixture of copper and tin, but various things are used; from 3 to 4 parts of copper to 1 part of tin, or 6, 7 or 8 parts of copper to 1 part of zinc; these are dark red bronze. Lighter gold bronzed with less copper. As for the moulding of the articles, that will depend upon what it is, a bust or a ball; and it would take up a great deal of our space to describe. If you wish to make a bronze casting off a plaster bust, first make a plaster mould of the exterior, then make a hollow wax model as the hollow plaster casts are made; take out and trim up, and imbed in some fine sand tempered with salt and water, and place in a warm place to become dry. You can afterward subject it to a greater heat and run the wax out, or let the mould absorb it, and while your mould is hot you may pour the metal in. Do not put it by to absorb the moisture again before using it. Fletcher's furnaces will, I have not the least doubt, answer your purpose in a small way. To color after dressing up: Cover with wet blacklead, and brush up to a polish, for black or dark green; and for red, with Venetian red; and for the green dust, suspend it over the fumes of vinegar or acetic acid.

Bronze, to Clean. See **Cleansing.**

Bronze, to Color.—As to the coloring which may be given to bronze, and which is obtained by various methods of oxidation, the following are some of the methods in vogue:

1. The dull color of medal bronze is obtained by rubbing with a mixture of red ocher and blacklead applied by a brush.

2. The antique green is obtained by washing the metal in a liquid made of 10 gr. marine salt, the same quantity of cream of tartar and acetate of copper, the whole dissolved in 200 gr. vinegar and 30 gr. carbonate of soda.

3. The Florentine is obtained by means of green vitriol (sulphate of iron), and then rubbing with wax.

4. The citron tint is obtained by means of red ocher mixed with lampblack and oil.

5. The old green bronze is obtained by several dippings in acid, and subsequently with wax.

6. Verdigris is obtained by means of sal ammoniac, and wax afterward.

7. The smoke tint is produced by annealing the object in a wisp of hay or straw, which is set on fire, and the article is burnished so that the oxide formed may penetrate the metal. The smoke of turf may be used instead, waxing afterward, and removing the grease by turpentine, so as to carry off the uneven first layer.

8. Dark or Berlin Bronze.—Cleanse the metal by dipping it first momentarily in nitric acid, then rinsing quickly in running water, and rubbing with sawdust. The bronzing dip may be prepared by dissolving in 1 gal. hot water ½ lb. each perchloride of iron and perchloride of copper. The metal should not be allowed to remain in this dip any longer than is necessary to produce the desired color. Rinse well, dry, and polish in warm sawdust or with a rag buff.

9. In preparing bronze medals for the Melbourne exhibition, a rich chocolate color was obtained by the addition of a little copper acetate, mixed with an alkaline sulphide, to the ordinary colcothar bronzing powder, by which a film of mixed copper sulphide and oxide, somewhat resembling Chinese bronze, was produced.

Bronze, Coloring of. See also **Brass.**

Bronze Monuments, to Preserve.—Brush over at intervals with a mixture of 1 part of acetic acid and 5 parts of neatsfoot oil.

Bronze Paints. See **Paints.**

Japanese Pickles for Bronze and Copper.—They are used boiling.

	I.	II.	III.
Verdigris	438 grn.	87 grn.	220 grn.
Sulphate of copper	292 "	437 "	540 "
Niter	—	87 "	—
Common salt	—	146 "	—
Sulphur	—	233 "	—
Water	1 gal.	—	1 gal.
Vinegar	—	1 gal.	5 fl. dr.

That most widely employed is No. I. When boiled in No. III. solution, pure copper will turn a brownish red, and shaku-do, which, you will remember, contains a little gold, becomes purple. And now you will be able to appreciate the effect of small quantities of metallic impurity as affecting the color resulting from the action of the pickle.

Bronzing. See also **Brass,** Coloring of.

Bronzing is now performed according to the color desired; for, although the word means a brown color, being taken from the Italian *bronzino*, signifying burnt brown, yet in commercial language it includes all colors. Success in the art of bronzing greatly depends on circumstances, such as the temperature of the alloy or of the solution, the proportions of the metals used in forming the alloy, and the quality of the materials. The moment at which to withdraw the goods, the drying of them, and a hundred little items of care and manipulation, require attention which experience alone can impart.—*Eng. Mechan.*

Alabaster or Plaster, to Bronze.—I. Prepare the surface by sizing it over once or twice, and when dry touch the prominent parts of the figure with the bronze No. 1, and the remainder with No. 2. Then soften down the lines of mixture of the two paints with a badger's hair tool.

No. 1. Grind equal parts of Dutch metal and the following paint together, and thin the mixture with a little oil or turpentine.

No. 2. Grind Prussian blue, verdigris and ocher separately with oil, then mix them together, in such proportions as will produce a bronze green color.

II. Touch over the prominent parts of the figure with Bessemer's gold paint, or instead thereof use gold or Dutch leaf, then cover the remainder of the figure as before with the paint No. 2.

Aniline Bronzing Fluid.—Take 10 parts of aniline red and 5 parts of aniline purple and dissolve in 100 parts of alcohol at 95°, taking care to help the solution by placing the vessel in a sand or water bath. As soon as the solution is effected, 5 parts of benzoic acid are added, and the whole is boiled from five to ten minutes until the greenish color of the mixture is transformed into a fine light colored bronze. This bronze is stated to be very brilliant, and to be applicable to all metals, as well as to other substances. It is easily laid on with a brush, and dries promptly.

Bronzing Fluids.—1. Red aniline 50 gr., violet aniline 50 gr., alcohol 2 oz., benzoic acid 50 gr. Dissolve the aniline in the alcohol, in a bottle, by the aid of water bath, add the benzoic acid, boil in the water bath five or ten minutes, until the greenish color of the liquid has changed to a light brownish bronze. This is applied to leather, metal, wood or other surfaces.—*Western Druggist.*

2. Brown Bronze Dip.—Iron scales, ½ lb.; muriatic acid, ½ lb.; arsenic, ½ oz.; zinc (solid), ½ oz. Keep the zinc in only while it is in use.

3. Green Bronze Dip.—Verditer green, 4 oz.; salt, 4 oz.; wine vinegar, 4 qt.; sal ammoniac, 2 oz.; alum, 1 oz.; French berries, 16 oz. The ingredients should be boiled together.

4. Olive Bronze Dip for Brass.—Muriatic acid, 1 oz.; nitric acid, 1½ oz.; add palladium or titanium. Dissolve the metal and add 1 gal. pure soft water to each pint of the solution.

5. Black Bronze for Brass.—Dip the article bright in aquafortis; rinse the acid off with clean water, and place it in the following mixture until it turns black: Hydrochloric acid, 12 lb.; sulphate of iron, 1 lb.; and pure white arsenic, 1 lb. It is then taken out, rinsed in clean water, dried in sawdust, polished with blacklead, and then lacquered with green lacquer.

6. Take 1 pt. strong vinegar, 1 oz. sal ammoniac, ½ oz. alum, ¼ oz. arsenic; dissolve them in the vinegar, and the compound is fit for use. We know brass founders who have been in the habit of using this for several years, and, where the metal is good, it is seldom found to fail.

7. For a dipping brown, use to 1 pt. of water 5 drm. perchloride of iron. The articles must be made perfectly clean and dipped in the hot solution until the required color is obtained; then dipped in clean hot water, dried, and lacquered. If only a varnish is required, use clear shellac varnish colored with dragon's blood, gum, and burnt umber.

8. Fuchsin, 10 parts; aniline purple, 5 parts; methylated spirit, 100 parts. Apply heat, and when solution has taken place, add benzoic acid, 5 parts. Then boil the whole for about five or ten minutes until the greenish color of the mixture has changed to bronze brown.—*Chemicus.*

9. Stroschein, of Berlin, makes this by treating dammar resin with about ⅓ of its weight of carbonate of potassium, stirring for about three days, and then finely powdering the resinous mass. Next it is scattered in thin layers

on hurdles exposed to a temperature of about 50° C., and left for several months. The resin is then dissolved in benzine or another distillate of naphtha under a boiling point of 150° C., after dry ammonia gas has been led through the solvent. The bronze powder remains suspended in this varnish. Articles bronzed with it are said to retain for years together the original fresh metallic luster.

10. Ormolu Dipping Acid for Sheet Brass.—Niter, 6 lb.; sulphuric acid, 1 gal.; nitric acid, ½ pt.; muriatic acid, ½ pt. Put in the muriatic acid last, a little at a time. Stir with a stick.

11. Parisian Bronze Dip.—Sal ammoniac, 1 oz.; common salt, 1 oz.; ammonia, 2 oz.; dissolved in 2 qt. vinegar. Clean the metal, rub with the solution, dry by friction with a brush.

12. Pale Deep Olive Green Bronze.—Perchloride of iron, 1½ parts; water, 3 parts. Mix, and immerse the brass.

13. Bronzing Small Brass Articles.—1 part oxide of iron, 1 part white arsenic, 12 parts hydrochloric acid. Clean the brass well to get rid of lacquer or grease, and apply with a brush until the desired color is obtained. Stop the process by oiling well, when it may be varnished or clear lacquered.

14. Bronze Gold.—2½ parts burnish gold, 2 oxide of copper, 1 quicksilver, ¼ gold flux. Having dissolved the copper in aquafortis, it is again separated from its solvent and falls to the bottom of the vessel by the addition of iron; the precipitate of copper may be increased or diminished at discretion, which makes the bronze richer or poorer in color, according to the proportion of burnish gold contained in the mixture. It is chiefly used for ornamenting the handles and heads of jars, vases, and so on, and occasionally intermixed with burnish gold.

15. Green Bronze.—Dissolve 2 oz. of nitrate of iron and 2 oz. of hyposulphite of soda in 1 pt. of water. Immerse the articles in the bronze till of the required tint, as almost any shade from brown to red can be obtained; then well wash with water, dry, and brush. One part of perchloride of iron and 2 parts of water mixed together, and the brass immersed in the liquid, gives a pale or deep olive green, according to the time of immersion. If nitric acid is saturated with copper, and the brass dipped in the liquid and then heated, it assumes a dark green. If well brushed, it may be lacquered with pale gold lacquer, or else polished with oil.

16. *Bronzing Brass by Simple Immersion.*

By Messrs Bowen & Co., brass founders, etc., London.

Water.	Nitrate of iron.	Perchloride of iron.	Permuriate of iron.	Nitrate of copper.	Tersulphide of arsenic.	Muriate of arsenic.	Potash solution of sulphur.	Pearlash solution.	Cyanide of potassium.	Ferrocyanide of potassium.	Sulphocyanide of potassium.	Hyposulphite of soda.	Nitric acid.	Oxalic acid.	Color.
pt.	dr.	dr.	pt.	oz.	gr.	oz.	dr.	dr.	oz.	pt.	dr.	dr.	dr.	oz.	
1	5	....	...	.	....	..	....	..	....	....	....	...	....	....	Brown and every shade to black.
1	....	5	....	....	....	..	....	....	....	....	....	....	....	....	Brown and every shade to black.
1	16	....	....	....	....	....	....	....	....	....	....	16	....	....	Brown and every shade to red.
1	....	....	....	....	....	..	....	....	....	....	....	16	1	...	Brown and every shade to red.
1	...	....	....	1	....	....	....	....	....	....	....	....	....	1	Brownish red.
....	....	....	....	....	....	....	....	....	....	1	....	....	3	....	Brownish red.
1	....	....	....	....	....	....	....	....	1	....	....	....	4	....	Dark brown.
1	...	....	....	....	30	....	....	6	....	....	....	.	....	....	Yellow to red.
1	..	....	....	....	....	....	1	....	....	....	....	....	....	..	Orange.
2	.	....	1	....	....	....	....	....	....	....	....	....	....	...	Olive green.
1	....	5	....	....	....	....	....	....	....	....	2	....	....	....	Slate.
1	.	....	....	.	....	....	....	....	....	....	....	20	....	..	Blue.
1	.	...	..	..	....	1	....	....	.	....	....	..	....	....	Steel gray.
1	.	.	2	....	....	10	....	....	....	....	....	....	....	....	Black.

In preparation of No. 5, liquid must be brought to a boil and cooled. In using No. 13 the heat of the liquid must not be under 180°. No. 6 is slow in action.

The action of the others is for the most part immediate.—[*English pint*, 20 *oz.*—Ed.]

17. *Bronzing Fluids for Copper by Simple Immersion.*

Water.	Nitrate of iron.	Sulphate of copper.	Sulphide of antimony.	Sulphur.	Muriate of arsenic.	Pearlash.	Sulphocyanide of potassium.	Hyposulphite of soda.	Hydrochloric acid.	Color.
pt.	drm.	oz.	drm.	drm.	drm.	oz.	drm.	oz.	drm.	
1	5	.....	. ....	.....	.....	.....	.....	.....	.. ..	Brown and every shade to black.
1	5	.....	.. ...	.....	.....	.....	2	.....	.. ..	Dark brown drab.
1	. ....	1	... ..	.....	.....	...	.....	1	2	do.
1	.....	.....	2	.....	.....	1	.....	.. ..	. ....	Bright Red.
1	.....	.. ...	.....	1	.....	1	.....	.. ..	.. ...	Red and every shade to black.
1	.....	.....	..	.....	1	..	.. ..	.. ...	.....	Steel gray at 180.

18. Bronze Green Dip.—Wine vinegar, 2 qts.; verditer green, 2 oz.; sal ammoniac, 2 oz.; alum, 1 oz.; salt, 2 oz.; alum, ½ oz.; French berries, 8 oz.; boil the ingredients together.

19. To Bronze Castings (by Dipping).—Pickle the castings in sulphuric acid and water (1 to 10), scour with sand; then dip for an instant in solution of copper sulphate, 3 oz.; sulphuric acid, 5 oz.; 1 gal. of water. Rinse in cold water and dry in sawdust.

Bronze on Feathers.—Fashion has introduced gilded and silvered feathers. It is chiefly goose feathers and wings of pigeons which appear covered with gold and silver. The process is very simple. The feather is dipped in bronze powder and rubbed with a piece of wash leather. In course of wearing, however, the bronze is very easily detached. To prevent this, the feather, before being dipped in the bronze powder, is taken through gum water, pressed nearly dry between cloths, and in its slightly adhesive state is treated with bronze powder. Partially bronzed feathers and wings are produced by covering those parts which are to remain plain with pasteboard, and the bronze powder is rubbed upon the rest with a feather. Of course varied effects may be produced by dyeing the feathers with aniline colors, etc., prior to the application of the bronze.—*Faerber Zeitung.*

1. Bronzing Liquids for Gun Barrels.—Aqua-fortis, ½ oz.; sweet spirits of niter, ½ oz.; spirit of wine, 1 oz.; sulphate of copper, 2 oz.; water, 30 oz.; tincture of muriate of iron, 1 oz.; mix.

2. Sulphate of copper, 1 oz.; sweet spirits of niter, 1 oz.; water, 1 pt.; mix. In a few days it will be fit for use.

3. Sweet spirits of niter, 3 oz.; gum benzoin, 1½ oz.; tincture of muriate of iron, ½ oz.; sulphate of copper, 2 drms.; spirit of wine, ½ oz.; mix, and add 2 lb. of soft water.

4. Tincture of muriate of iron, ½ oz.; spirit of nitric ether, ½ oz.; sulphate of copper, 2 scruples; rain water, ½ pt.

The above are applied with a sponge, after cleaning the barrel with lime and water. When dry, they are polished with a stiff brush or iron scratch brush.

Bronzing Inlaid Work.—A method used for decorating inlaid work is the use of a bronzing liquid, which consists of a fluid bronze composition formed by combining metallic powder of gilding and bronze powder with collodion, which composition is capable of being applied as a bronze liquid to surfaces of wood, iron, or any solid material, for the purpose of coating the same for decoration or preservation.

To Bronze Steam Pipes Used for Steam Heating.—Use ordinary chrome yellow for painting the pipes; when this is nearly dry, rub on gold bronze powder with a piece of fur. Varnish with thin copal varnish or mastic varnish, when thoroughly dry.

Iron, to Bronze.—The following is a method of giving cast iron the appearance of bronze without coating it with any metal or alloy: The article to be so treated is first cleaned, and then coated with a uniform film of some vegetable oil; this done, it is exposed in a furnace to the action of a high temperature, which, however, must not be strong enough to carbonize the oil. In this way the cast iron absorbs oxygen at the moment the oil is decomposed, and there is formed at the surface a thin coat of brown oxide, which adheres very strongly to the metal, and will admit of a high polish, giving it quite the appearance of fine bronze.

Size for Bronze Powder for Iron.—To 1 pt. of methylated finish add 4 oz. of gum shellac and ½ oz. gum benzoin. Put the bottle in a warm place and agitate it occasionally. When the gums are dissolved, let it stand in a cool place two or three days to settle; pour off the clear portion and reserve for finest work, using the sediment, which by addition of more alcohol may be made workable, when strained for first coat or coarser work. Add the bronze (q. s.) to this, and apply to the clean, smooth, warm iron, using a soft brush. Repeat, after drying, if necessary. Thin with alcohol, if necessary, to avoid wrinkles and brush marks. Varnish over all.

To Bronze Iron Castings.—The castings must first be thoroughly cleansed. Immerse in a solution of sulphate of copper, when the castings will acquire a coat of the copper. Wash in water.

Bronzing Articles Made of Iron Wire.—The following is commended as the best and cheapest process: Clean the wire perfectly, and then immerse it in a solution of sulphate of copper (blue vitriol) until covered with a coating of metallic copper. Then wash and immerse the articles in the following solution: Verdigris, 2 oz.; sal ammoniac, 1 oz.; vinegar, 1 pt.; diluted with water until it tastes only slightly metallic, then boiled for a few minutes and filtered. The articles are steeped in this liquor at the boiling point, until the desired effect is produced; but do not keep them in too long. When taken out, wash carefully in hot water and dry.

Bronzing for Leather.—A small amount of so-called insoluble aniline violet is dissolved in a little water, and the solution is brushed over the articles; it will dry quickly, and perhaps may have to be repeated. Shoes that are treated in this way present a beautiful bronze color.

Bronzing Metals and Ornaments of Copper, Electrotypes, etc.—1. Having thoroughly cleaned and polished the surface of the specimen, with a brush apply the common crocus powder, previously made into a paste with water. When dry, place it in an iron ladle, or on a common fire shovel, over a clear fire for about one minute, and when sufficiently cool polish with a plate brush. By this process a bronze similar to that on tea urns is produced; the shade depending upon the duration of the exposure to the fire.

2. By substituting finely powdered plumbago for crocus powder in the above process, a beautiful deep and permanent bronze appearance is produced.

3. Rub the metal with a solution or potassium sulphide (liver of sulphur, old name), then dry. This produces the appearance of antique bronze very exactly.

4. Dissolve 2 oz. of verdigris and 1 oz. sal ammoniac in 1 pt. of vinegar, and dilute the mixture with water until it tastes but slightly metallic, when it must be boiled for a few minutes and filtered for use. Copper medals, etc., previously thoroughly cleaned from grease and dirt, are to be steeped in the liquor at the boiling point, until the desired effect is produced. Care must be taken not to keep them in the solution too long. When taken out, they should be carefully washed in hot water and well dried. Gives an antique appearance.

5. Chinese Method.—Make a paste with 2 oz. each of verdigris and vermilion, 5 oz. of alum and sal ammoniac, all in fine powder, and vinegar, q. s.; then spread it over the surface of the copper, previously well cleaned and brightened uniformly, warm the article by the fire, and afterward well wash and dry it, when, if the tint be not deep enough, the process may be repeated. The addition of a little blue vitriol inclines the color to a chestnut brown and a little borax to a yellowish brown. Much employed by the Chinese for copper tea urns.

6. Dissolve 1 oz. of sal ammoniac, 3 oz. cream of tartar, and 6 oz. of common salt in 1 pt. of hot water; then add 2 oz. of nitrate of copper, dissolved in ½ pt. of water; mix well, and apply it repeatedly to the article, placed in a damp situation, by means of a brush moistened therewith. Effect very antique.

7. Potassium binoxalate ¼ oz.; sal ammoniac, 1 oz.; distilled vinegar, 2½ pt.; dissolve. As last.

Mildew, Bronze Imitation of.—Dissolve equal weights of nitrate of iron and hyposulphite of soda in 8 parts of water; immerse the

articles in this until of the right tint, then well wash with water, dry, and brush; 1 part chloride of iron and 2 parts water imparts to brass a fine antique green. Brush well and lacquer with pale gold or lacquer, polish with oil.

Paper, to Bronze.—Gum is substituted for drying oil in bronzing paper. When it is dry, the paper is submitted to the action of the burnisher, which imparts great brilliancy to it.

Bronzing Plaster Cast.—1. Coat the figure with isinglass size until the surface continues in a moist state, and will absorb no more; then touch it over lightly and sparingly with gold size, and put it away in a clean dry place for forty-eight hours. Touch the figure all over with bronze powder, and after the lapse of twenty-four hours, brush off all the loose powder, and particularly from the projecting parts of the figure.

2. The following is given as a process used in France for this purpose. Linseed oil soap is made by saponifying the oil with caustic soda and precipitating the soap with salt. It is separated, dissolved in rain water, and a mixture in solution of 4 parts blue vitriol and 1 part copperas is added as long as a precipitate forms. This is filtered out, washed and dried, and 8¾ oz. are applied with 1 lb. quick-drying varnish and 5¼ oz. white wax. This is applied to the surface previously heated, and is baked in if necessary. The high parts are touched up with a bronze powder. As a simpler process, shellac the bust and then gild it with bronze powder and varnish. The varnish is sold with the powder. See also No. 23 below.

Bronze Powder and Bronzing.—Bronze powder is finely pulverized metal or powder having a metallic base, applied to the surface of various articles for the purpose of imparting a metallic color or luster.

1. Gold powder for bronzing is made by grinding leaf gold with honey, dissolving the mixture to obtain the gold by deposition, the honey water being decanted. German gold is a yellow alloy leaf similarly treated. Silver bronze can be made in the same way, using silver leaf, or dissolve silver in nitric acid and precipitate by means of polished copper, sheet or wire.

2. Mosaic gold is prepared by incorporating and grinding: tin, 16; flower of sulphur, 7; mercury, 8; and sal ammoniac, 8; then subliming the amalgam. A flaky gold colored powder remains in the matrass.

3. Copper powder is obtained by saturating nitrous acid with copper, and then precipitating the copper by exposing iron bars in the solution.

4. Bisulphide of tin has a golden luster, flaky texture, and is used for ornamental work, such as paper hangings, and as a substitute for gold leaf.

5. Dutch foil, reduced to a powder by grinding, is also used, and powdered plumbago gives an iron-colored shade.

6. Another kind is made from verdigris, 8; putty powder, 4; borax, 2; niter, 2; bichloride of mercury, ¼; grind into a paste with oil and fuse them together.

7. Another (red): sulph. copper, 100; carb. soda, 60; mix and incorporate by heat; cool, powder, and add copper filings, 15; mix; keep at a white heat for twenty minutes; cool, powder, wash, and dry.

8. Bronzing is the process of giving a bronze-like or antique metallic appearance to the surface of metals. The processes vary: they may be classed as coating with a metal alloy, coating with a metal in paste, solution, or vapor, corrosion, coating with a gum, applying bronze powder, and painting. The modes vary with the material. The methods as to copper (some of them applicable to brass) are as follows: The surface is cleaned, polished, and a paste of crocus powder and water applied to it. Apply heat to develop the color required.

9. Plumbago applied in the same manner. By applying mixtures of plumbago and crocus different shades are obtained.

10. The copper is exposed at a high heat to the fumes of zinc.

11. The copper vessel is filled with water acidulated with hydrochloric acid, an amalgam of zinc and cream of tartar being added. Boil for a while. The two latter processes are more properly brassing.

12. Corrosion processes are as follows: Wash the cleaned copper with a dilute solution of sulphuret of potassium, or hydrosulphuret of ammonia is applied with a brush.

13. Apply a solution of verdigris, 2; sal ammoniac 1; vinegar, 16.

14. Or, verdigris, 2; vermilion, 2; alum, 5; sal ammoniac, 5; vinegar sufficient to form a thick paste. Blue vitriol inclines to dark brown, borax to yellow brown.

15. Or, sal ammoniac, 1; cream tartar, 3; common salt, 3; hot water, 16; dissolve, and add nitrate of copper, 3; dissolved in water, 8; apply repeatedly with a brush.

16. Or, potassium binoxalate, 1; sal ammoniac, 3; distilled vinegar, 32; apply as above.

17. For iron: Clean the metal, and wash it or immerse it in a solution of sulphate of copper, or verdigris, when it will acquire a coating of copper.

18. The polished metal—a gun barrel, for instance—may be dipped in a solution of chloride of antimony and sulphate of copper. This is browning.

19. The iron is cleaned, polished, and lacquered. The lacquer consists of shellac in alcohol, with or without the addition of saffron, annatto, aloes, or other coloring substances.

20. The iron is cleaned, polished, coated with linseed oil, and heated to develop the tint required.

21. Brown bronze dip, for coating hat hooks and similar small hardware articles, is made of iron scales, 1 lb.; arsenic, 1 oz.; muriatic acid, 1 lb.; zinc, solid, 10 oz. The zinc should be kept in only when the bath is used. The castings must be perfectly free from sand and grase.

22. For tin: Clean the castings, and wash them with a mixture of 1 part each of sulphate of copper and sulphate of iron in 20 parts of water; dry and wash again with a solution of verdigris, 5 parts; in distilled vinegar, 11 parts. When dry, polish with colcothar.

Plaster of Paris statuettes, models, etc., are bronzed in the following manner:

23. Prepare a soap from linseed oil boiled with caustic soda lye, to which add a solution of common salt, and concentrate it by boiling till it becomes somewhat granular upon the surface: it is then strained through a linen cloth, and what passes through is diluted with boiling water, and again filtered. Dissolve 4 parts blue vitriol and 1 part copperas separately in hot water, and add this solution to the solution of soap as long as it occasions any precipitate. This flocculent precipitate is a combination of the oxides of copper and iron with the margaric acid of the soap, the former giving a green and the latter a reddish brown color, the combination of the two resembling that greenish rust which is characteristic of ancient bronzes. When the precipitate is completely separated, a fresh portion of the vitriol solution is to be poured upon it in a copper pan, and boiled in order to wash it. After some time the liquid is poured off and the soap washed with warm and afterward with cold water, pressed in a linen bag, drained, and dried, when it is ready for use in the following manner: 3 lb. of pure linseed oil are boiled with 12 lb. of finely powdered litharge, and the mixture is strained through a canvas cloth and permitted to stand in a warm place until it becomes clear. 15 oz. of this, 12 oz. of the above described soap, and 5 oz. of fine white wax are melted together at a gentle heat in a porcelain basin by means of a water bath. The mixture must be kept some time in a

molten state, to expel any moisture which it may contain. It is then applied by means of a paint brush to the surface of the gypsum, which is heated to the temperature of about 200° F. After exposure to air for a few days, the surface is rubbed with cotton wool or a fine rag, and variegated with a few streaks of metal powder or shell gold. Small objects may be dipped in the melted mixture and then exposed to the heat of the fire until thoroughly penetrated and evenly coated with it.

24. Silver Bronze Powder.—Melt together 1 oz. each of bismuth and tin, then add 1 oz. quicksilver, cool and powder.

25. Gold Bronze Powder.—1. Pure gold bronze powder may be made as follows: Grind leaf gold with pure honey until the leaves are broken up and minutely divided. Remove this mixture from the stone by a spatula and stir up in a basin of water; the water will melt the honey and set the gold free. Leave the basin undisturbed until the gold subsides. Pour off the water and add fresh instead, until the honey is entirely washed away, after which collect the gold on filtering pans and dry for use. 2. A cheaper sort may be made thus: Melt 1 lb. of tin in a crucible and pour it on ½ lb. of pure mercury; when this is solid grind it into powder with 7 oz. of flowers of sulphur and ½ lb. of sal ammoniac.

26. Bronze Powders.—Bright yellow, copper 83 parts, zinc 17 parts; orange, copper 90 to 95 parts, zinc 5 to 10 parts; copper red, copper 97 to 99 parts, zinc 1 to 3 parts.

27. Bronze, Method of Applying the.—Go over the part you intend to bronze with gold size or varnish. When it is sufficiently dry—that is, when it does not adhere to the finger, but feels clammy—dip a piece of cotton, rolled into a hard ball, in your bronze powder, and dab it on the place to be bronzed.

28. Bronze powder may be mixed into a paint by using japan drier with a small percentage of boiled linseed oil. Both should be fresh.

To Bronze Rifles.—Take the breeches out, and stop orifices at each end; rub barrels over with hot lime to take off all grease, then clean them carefully; do not touch the barrels with your hands. Get from a chemist 60 drops sweet spirit of niter, 60 drops tincture of iron, 16 grns. sublimate of mercury, 16 grns. green copperas, 16 grns. blue vitriol, add 4 teaspoonfuls water, then with a pad of cotton wool wet the barrels and leave them until well rusted, then polish with steel brush—to be obtained from a gunmaker; repeat ten times, then wash with boiling water, and oil. Be careful with stain, as it is a deadly poison.

To Bronze Polished Steel.—Methylated spirits, 1½ pt.; gum shellac, 6 oz.; gum benzoin, ¾ oz. Set the bottle in a warm place, shake occasionally. When dissolved decant the clear liquid for fine work, strain the dregs through muslin. Mix with the varnish in quantities to suit 6 oz., powdered bronze green, varying the color with yellow ocher and lampblack as desired. Apply the varnish to the articles after cleaning and warming them; give them two coats.

Bronzing, Surface.—This term is applied to the process of imparting to the surfaces of figures of wood, plaster of Paris, etc., a metallic appearance. This is done by first giving them a coat of oil or size varnish, and when this is nearly dry applying with a dabber of cotton or a camel hair pencil any of the metallic bronze powders; or the powder may be placed in a little bag of muslin, and dusted over the surface, and afterward finished off with a wad of linen. The surface must be afterward varnished.

Paper is bronzed by mixing the powders up with a little gum and water, and afterward burnishing.

Iron Castings may be bronzed by thorough cleaning and subsequent immersion in a solution of sulphate of copper, when they acquire a coat of the latter metal. They must be then washed in water.

Bronzing Tin Castings.—When clean, wash them with a mixture of 1 part each sulphate of iron and sulphate of copper, in 20 parts water; dry, and again wash with distilled vinegar 11 parts, verdigris 4 parts. When dry, polish with colcothar.—*Druggists' Circular.*

Red Copper Bronze on White Sheet Tin and Tinned Articles.—Dissolve 18 drm. copper sulphate in rain water until this is saturated; add 80 to 160 drops sulphuric acid. Cleanse the tin with onion juice. Then brush with the fluid. When dry, rub with chalk and rinse.

Bronzing Wood.—1. The wood is first covered with a uniform coating of glue, or of drying oil, and when nearly dry the bronze powder, contained in a small bag, is dusted over it. The surface of the objects is afterward rubbed with a piece of moist rag. Or the bronze powder may be previously mixed with the drying oil, and applied with a brush.

2. First coat the clean wood with a mixture of size and lamp black; then apply 2 coats of the green-colored sizing in the last recipe, and lastly with bronze powder, such as powdered Dutch foil, mosaic gold, etc., laid on with a brush. Finish with a thin solution of Castile soap; when dry rub it with a soft woolen cloth.

Zinc, to Bronze.—First give a coat of brass (see Electro-Metallurgy). Then wet with a cloth dipped in copper protochloride dissolved in hydrochloric acid. When dry, brush with a mixture of equal parts iron peroxide and plumbago mixed up with a little essence of turpentine. Varnish with thin copal varnish.

Bronzing for Zinc, by Simple Immersion.

Water.	Nitrate of Iron.	Protochloride of Tin.	Sulphate of Copper.	Ferrous Chloride.	Lead Chloride.	Pearlash.	Sulphocyanide of Potassium.	Hyposulphite of Soda.	Garancine Infusion.	Logwood Infusion.	
pt.	dr.	dr.	dr.	dr.	oz.	oz.	dr.	dr.			
1	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	Black.
1	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	Black.
1	.....	1	.....	.....	.....	.....	1	.....	.....	.....	Dark gray.
2	.....	.....	1	1	.....	.....	.....	.....	.....	.....	Dark gray.
.....	.....	.....	.....	.....	× *	.....	.....	.....	.....	.....	Dark gray.
2	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	Green gray.
.....	.....	.....	.....	.....	.....	.....	.....	.....	×	.....	Red—Boil.
1	.....	.....	4	.....	.....	4	.....	.....	.....	.....	Copper color. Plates so clean.
1	.....	.....	8	.....	.....	.....	.....	8	.....	.....	Copper color, with agitation.
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	×	Purple—Boil.

* Made to the consistency of cream.

Browning of Metals.—*Browning of Copper.*—Scour brightly with fine glass paper, heat over a clear fire, then brush over with a solution prepared as follows: Copper acetate (cryst.), 5%; ammonium chloride, 7%; acetic acid, diluted, 3%; water distilled, 85%. Then rub with 1 part of wax cut in 4 parts of turpentine.

Browning Guns.—The following recipe for browning is from the U. S. Ordnance Manual: Spirits of wine, 1½ oz.; tincture of iron, 1½ oz.; corrosive sublimate, 1½ oz.; sweet spirits of niter, 1½ oz.; blue vitriol, 1 oz.; nitric acid, ¾ oz. Mix and dissolve in 1 qt. of warm water and keep in a glass jar. Clean the barrel well with caustic soda water to remove grease or oil. Then clean the surface of all stains and marks by emery paper or cloth, so as to produce an even bright surface for the acid to act upon, and one without finger marks. Stop the bore and vent with wooden plugs. Then apply the mixture to every part with a sponge or rag, and expose to the air for twenty-four hours, when the loose rust should be rubbed off with a steel scratch brush. Use the mixture and the scratch brush twice, and more if necessary, and finally wash in boiling water, dry quickly, and wipe with linseed oil or varnish with shellac.

Browning for Twist Gun Barrels.—Black brimstone, ½ oz.; tincture of steel, or the unmedicated tincture of iron, 1½ oz.; blue vitriol 1 oz.; corrosive sublimate, ½ oz.; copperas, ½ oz.; nitric acid, 2 drm.; spirits of niter, 1½ oz. Add 3 parts of rain water, and bottle for use. This mixture causes the twist of the barrel to be visible after application.

Browning of Gun Barrels, etc.—Wet a piece of rag with chloride of antimony, dip it into olive oil, and rub the barrel over. In 48 hours it will be covered with a fine coat of rust. Then rub the barrel with a fine steel scratch brush, and wipe with a rag dipped in boiled linseed oil.

Iron and Steel.—1. Dissolve in 4 parts of water, 2 parts of crystallized iron chloride, 2 parts of antimony chloride, and 1 part of gallic acid, and apply the solution with a sponge or cloth to the article and dry it in the air. Repeat this any number of times, according to the depth of color which it is desired to produce. Wash with water, and dry, and finally rub the articles over with boiled linseed oil. The metal thus receives a brown tint, and resists moisture. The antimony chloride should be as little acid as possible.

2. A process having this end in view has been recently patented in Germany by Mr. A. De Meritens. The goods to be browned form the anode of the bath, which consists of ordinary or distilled water. The cathode is formed by the vessel which contains the water, if it is made of iron; otherwise a plate of iron, copper, or carbon is placed in the bath. The water is kept at from 160° F. to 180° F., and the tension of the current must be sufficiently great to decompose the water. The oxygen which thus is given off at the anode forms in an hour or two a layer of the black oxide of iron (a combination of ferrous and ferric oxide), which is said to polish up very well. Steel is said to give the best results; in the case of cast and wrought iron, the oxide of iron formed separates as a powder; and it is necessary to use distilled water in order to obtain a layer which will adhere to the goods.

Brown Pigments. See **Pigments.**

Bruises.—A bruise is the discoloration caused by the extravasation of blood from ruptured vessels, and is due either to a blow or violent compression. Apply ice or some cold object as soon as possible after the injury. Pressure will also be of service. This method of treatment should be continued for at least two hours. The appearance of a bruise may be somewhat disguised by first covering it with a paste compound of prepared chalk 1 part, glycerine 1 part. This should be gently worked into the part and the excess wiped off. Over it 1 layer of flexible collodion should be spread by means of a brush. This will make the part of a white color.

Bruises in Furniture, to Remove.—To take out bruises in furniture wet the part with warm water, double a piece of brown paper five or six times, soak it and lay it on the place; apply on that a hot flatiron till the moisture is evaporated. If the bruise be not gone, repeat the process. After two or three applications, the dent or bruise will be raised level with the surface. If the bruise be small, merely soak it with warm water, and apply a red hot poker very near the surface; keep it continually wet, and in a few minutes the bruise will disappear.

Brunswick Black. See **Varnishes.**

Brushes, to Soften.—Steep the brushes for twenty-four hours in good benzole, and then if necessary purify by washing them with soap and warm water.

Bubbles, Soap. See **Soap Bubbles.**

Buff Leather.—Buff leather is made from the skins of various animals, as the buffalo, ox, etc. It is used for polishing, making belts, etc.

Buff Wheels, to Make.—Turn up the wooden disk to form the wheel on the mandrel on which it is to run. Cover the periphery of the wheel with good glue, prepared as for gluing wood, stretch the leather around and confine it with shoe pegs driven in about 2 in. apart. When dry turn off true with a sharp chisel. Give the leather a coat of glue and roll it in the emery, so as to make it retain it by being imbedded in the glue. Let the wheel dry until the glue is hard and it is ready for use.

Bugs, Use of Paris Green in Exterminating.—In using Paris green to exterminate the potato bugs, the poison should be mixed with the cheapest grade of flour, 1 lb. of green to 10 lb. of flour. A good way of applying it to the plants is to take an old 2 qt. tin fruit can, melt off the top, and put in a wooden head in which insert a *broom handle*. Bore a hole in the head also to pour the powder in, and then punch the bottom full of holes about the size of No. 6 shot. Walk alongside the rows, when the vines are wet with dew or rain, and make one shoot at each hill.

Bugs, Bed, to Destroy.—1. Rub the joints of the bedstead with equal parts spirits of turpentine and kerosene oil, and where there are many, the cracks in the surbase of the room. Filling up all the cracks with hard soap is a good remedy.

2. Take everything out of the infested room, plug up all the windows tightly, close all chimneys, and empty about 1 oz. of powdered sulphur on a pan of hot coals, placed in the middle of the floor. Shut the doors and cover all cracks; let the sulphur burn as long as it will. Where the room is large, it is a good plan to fasten a bit of tin tube to the bottom of the pan, and to this connect enough small rubber pipe to lead out of the nearest door. By blowing into the end of the pipe with the bellows, the sulphur will be caused to burn more quickly by the draught created, and to give a denser smoke. After the sulphur has burned out, paint all the cracks in the floor and around the mop board with a strong solution of corrosive sublimate, and treat the furniture to the same before replacing it. We have seen a room frightfully infested completely freed by this plan.

3. Mixtures such as equal parts of turpentine and kerosene oil are used; filling up the cracks with hard soap is an excellent remedy. Benzine and gasoline will kill bedbugs as fast as they can reach them. A weak solution of zinc chloride is also said to be an effectual banisher of these pests.

4. When they have made a lodgment in the wall, fill all the apertures with a mixture of soft soap and Scotch snuff. Take the bedstead to pieces, and treat that in the same way.

5. A strong decoction of red pepper applied to bedsteads will either kill the bugs or drive them away.

6. Put the bedstead into a close room and set fire to the following composition, placed in an iron pot upon the hearth, having previously closed up the chimney, then shut the door; let them remain a day: Sulphur, 10 parts; saltpeter, powdered, 1 part. Mix. Be sure to open the door of the room five or six hours before you venture to go into it a second time.

7. Rub the bedsteads well with lamp oil; this alone is good, but to make it more effectual, get ten cents worth of quicksilver and add to it. Put it into all the cracks around the bed, and they will soon disappear. The bedsteads should first be scalded and wiped dry; then put on with a feather.

8 Corrosive sublimate, 1 oz.; muriatic acid, 2 oz.; water, 4 oz.; dissolve, then add turpentine, 1 pt.; decoction of tobacco, 1 pt. Mix. For the decoction of tobacco boil 2 oz. of tobacco in 1 pt. of water. The mixture must be applied with a paint brush. This wash is a deadly poison.

9. Rub the bedsteads in the joints with equal parts of spirits of turpentine and kerosene oil, and the cracks of the surbase in rooms where there are many. Filling up all the cracks with hard soap is an excellent remedy. March and April are the months when bedsteads saould be examined to kill all the eggs.

10. Mix together 2 oz. of camphor, 4 oz. spirits of turpentine, 1 oz. corrosive sublimate, and 1 pt. alcohol.

11. Distilled vinegar, or diluted wood vinegar, 1 pt.; camphor, ½ oz.; dissolve.

12. White arsenic, 2 oz.; lard, 13 oz.; corrosive sublimate, ¼ oz.; Venetian red, ¼ oz. (Deadly poison.)

13. Strong mercurial ointment, 1 oz.; soft soap, 1 oz.; oil of turpentine, 1 pt.

14. Gasoline and coal oil are both excellent adjuncts, with cleanliness, in ridding a bed or house of these pests.

15. Benzine or gasoline will kill these pests as fast as they can be reached. By using a spring bottom oiler the fluid can be forced into all the cracks and crevices. As the fluid is inflammable, contact with fire must be avoided. The room should be well aired.

Bug Destroyer.—Tincture of tobacco 200 parts, boric acid 6 parts, carbolic acid 6 parts, salicylic acid 12 parts, oil of Indian balm 1 part.

Bug Poison.—Corrosive sublimate and muriatic acid, of each 1 oz., water 4 oz. Dissolve, then add turpentine and decoction of tobacco, of each ¾ of a pt.; mix. Use with caution.

Bugs in Hospitals.—The best remedy for bugs in hospitals is a bug trap, made by boring a series of holes in a piece of wood with a gimlet, and placing this under the mattress of each cot. The piece of wood is to be placed periodically into a basin of boiling water. This is an Indian hospital plan.

Building Materials, Weight of.—Sand weighs about 30 cwt. per cubic yard; gravel, the same; mud, 25 cwt.; marl, 26 cwt.; clay, 31 cwt.; sandstone, 39 cwt.; shale, 40 cwt.; quartz, 41 cwt.; granite, 42 cwt.; trap, the same; slate, 43 cwt.

Building Stones, Artificial. See **Cements.**

Bullet Metal. See **Alloys.**

Bunions. See also **Corns.**—1. For bunions and corns Cannabis indica and glycerine, equal parts, painted on the bunion or corn and bound around with Canton flannel, adding a few drops of the liquid to the flannel where it comes in contact with the affected parts, will soon restore to health.

2. An inflamed bunion should be poulticed, and larger shoes worn. Iodine, 12 gr., lard or spermaceti ointment, ½ oz., make a capital ointment for bunions. It should be rubbed on gently two or three times a day.

Burnettizing. See **Wood, Preservation of.**

Burnishing Ink. See **Inks.**

Burnishing Powder, Belgian.—Fine chalk, ¼ lb.; pipe clay, 1½ oz.; white lead, 1 oz.; magnesia (carbonate) ⅜ oz.; jewelers' rouge, ⅜ oz.

Burnishing Prints. See **Photography.**

Burns, Treatment of.—The *New York Medical Record* states that at the Roosevelt Hospital white lead paint has been found, after trying almost every plan of treatment hitherto proposed, to be the best and cleanest application. Mix as for painting, but considerably thicker, and apply with a brush. A very neat and satisfactory dressing in superficial burns consists in coating the surface with mucilage and then covering it with powdered lycopodium.

2. *Burns.*—Service of Dr. George F. Shrady, at St. Francis' Hospital, New York.—A number of cases of more or less severe burns have been treated very successfully by an application of a gum dressing which consists of a paste composed of gum acacia, 3 oz.; gum tragacanth, 1 oz.; carbolized water (1-60), 1 pt.; and molasses, 2 oz. It is applied to the burned surface with a broad flat camel's hair brush immediately on admission to the hospital, and dries in the course of an hour or two. The dressing is then renewed at suitable intervals, until a sound and nnyielding scab is formed. Generally four applications are necessary for this purpose. The molasses appears to prevent the contraction of the covering, while the carbolized water destroys any odor.

3. *Injuries from Acids.*—Strong acids applied to the skin cause intense pain and destruction of the tissues with which the liquids come into contact, the extent of the injury varying, of course, with the amount of acid applied. When the injury has been caused by sulphuric, nitric, or hydrochloric acid, apply dilute ammonia, chalk, carbonate of magnesia, or the plaster from the ceiling stirred in water. After an hour or so apply carron oil (olive oil and lime water in equal parts) on lint. For carbolic acid: Apply olive oil.

4. *Injuries from Caustic Alkalies,* as strong ammonia and potash. Apply a dilute acid, as vinegar; subsequently use: Olive oil, 1 part; carbonate of bismuth, 2 parts; spermaceti, 1 part; white wax, 1 part.

5. *Simple Burns and Scalds.*—If there are vesicles they should be pricked with a needle. The part should then be covered with carron oil (equal parts of olive oil and lime water), and lint soaked in the same should be applied over it. Externally to the lint a thick layer of cotton wool should be placed. After two days the carron oil may be discontinued, and the following substituted: Olive oil, 1 part; carbonate of bismuth, 1 part; or, starch powder, 1 part; powdered chalk, 1 part spermaceti, 2 parts; olive oil, 1 part. If carron oil (equal parts of olive oil and lime water) is not at hand, then olive oil, with equal parts of carbonate of soda, or powdered chalk, or powdered starch or flour, will be of service. Or, again, if olive oil is not at hand, the carbonate of soda may be dissolved in tepid water, and the part should be freely bathed with this, and then it should be thickly covered with a powder of the same. So also if the soda is not within reach, simple chalk, starch, or flour may be used as a powder. Never apply cold to a burn or scald.

Burnt Cork. See **Rouges and Face Paints.**

Burrstones, to Fill Holes in.—Use melted alum mixed with burrstone pulverized to the size of grains of sand.

Butter, to Color.—1. Use a little annatto: if pure it is not injurious.

2. The coloring matters commonly employed are annatto and turmeric, or extracts of these; but there are also a number of butter-coloring compounds or mixtures sold for this purpose. For some of these it is claimed that they will not only impart the desired color to butter, but will keep it sweet and fresh for an indefinite time. The following are a few of these coloring compounds in use at present. Rorick's compound is prepared as follows: The materials for 1,000 lb. of butter are: Lard, butter, or olive oil, 6 lb.; annatto, 6 oz.; turmeric, 1 oz.; salt, 10 oz.; niter, ⅔ oz.; bromochloralum, 3½ oz.; water, q. s. The lard, butter, or oil is put into a pan and heated in a water bath. The annatto and turmeric are then stirred into a thin paste with water, and this is gradually added to the fatty or oily matters kept at a temperature of about 110° F. The salt and niter are next stirred in, and the mixture heated to boiling. The heating is continued for from twelve to twenty-four hours, or until the color of the mixture becomes dark enough. The bromochloralum is then introduced, and the mass is agitated until cold, when it is put up in sealed cans.

3. Bogart's preparation is prepared as follows: The materials employed are: Annattoine, 5 oz.; turmeric (pulverized), 6 oz.; saffron, 1 oz.; lard oil, 1 pt.; butter, 5 lb. The butter is first melted in a pan over the water bath and strained through a fine linen cloth. The saffron is made into a ½ pt. tincture, and, together with the turmeric and annattoine, is gradually stirred into the hot butter and oil and boiled and stirred for about fifteen minutes. It is then strained through a cloth as before and stirred until cool.

4. Dake's butter coloring is prepared by heating a quantity of fresh butter for some time with annatto, by which means the coloring matter of the butter is extracted, and straining the colored oil and stirring it until cold.

Butter, to Make.—*Preparation of Milk for Creameries.*—1. See that the cows have an abundant supply of good, wholesome feed. Supplement the grass with bran or grain. Corn and pease make firm butter. If grass be dry or scarce, furnish green fodder. The quality of the feed determines to some extent the quality of the fat globules in the milk. Fine butter is mostly composed of these. Green fodder is fed with better effect on the quality of the butter after being wilted for a day or two.

2. See that the cows have a liberal supply of pure cold water. As well might a cook expect to make good, profitable porridge out of musty oatmeal and stagnant water as to get pure, sweet-flavored, wholesome milk out of musty feed and foul drink consumed by a cow.

3. See that the cows have access to salt every day. They know best when to help themselves.

4. Let the cows be saved from annoyance and worry. Any harsh treatment that excites a cow lessens the quantity and injures the quality of her yield.

5. Where practicable let the cows be milked regularly as to time and by the same person.

6. The udders should be well brushed and then rubbed with a coarse towel before milking.

7. All milk should be carefully strained immediately after the milking is completed.

8. Thorough airing of the milk for a few minutes by dipping, pouring or stirring will improve the flavor of the butter.

9. When set for the rising of the cream, milk should be at a temperature above 90° Fahr.

10. When deep setting pails are used, the water in the tank should be kept below or as near 45° Fahr. as possible.

11. The tank should be shaded from the sun.

12. When a flowing spring is not available, the cooling power of the fresh water may be used more economically if it be carried to the bottom of the tank and the warm water be caused to run off from the top. If water be scarce, the overflow may be carried into a watering trough for the stock of the farm.

13. Milk cans should be washed in cold or tepid water first, and then rinsed in boiling water before they are exposed to be aired. The addition of a little soda and borax to the hot water will increase its cleansing properties.

14. *Qualities of Cream.*—Since managers of creameries have adopted the plan of paying for cream according to its butter-making qualities, some dissatisfaction has been caused among the patrons by the differences which comparisons have made evident. In most cases the trouble arises from an erroneous idea that the richest cream is the best for butter making and the most profitable to the patron. It is not the patron who supplies the cream which yields the greatest number of ounces of butter per inch who always obtains the largest returns from the milk which has been set. Milk which has been set in deep pails at a high temperature, and has not been cooled below 60° F., will yield a cream very rich in butter-making quality; but there will be a smaller quantity of cream obtained from the milk, and a less quantity of butter, than where the milk is cooled as low as 45° F. The longer the time cream stands on milk after practically all of it has come to top, the less space will it occupy. As it shrinks in bulk it becomes richer per inch, but the total quantity of cream from the milk will not yield any more butter than it would have made before it became compact by long standing. (A creamery inch of cream is equal to 113 cubic inches or to 1 inch in depth of a cylindrical vessel 12 inches in diameter.) When the milk is skimmed every twelve hours the cream will not yield as many ounces of butter per inch as when it has been set for twenty-four hours or longer, but the extra quantity of cream that may be obtained by twelve hours setting in ice water will permit as much butter to be made from the milk as by setting it for a longer period.

15. Skimming should not be delayed longer than twenty-four hours after the milk is set. Cream should be removed from the milk before it is sour. Its value to a creamery for butter making depends not alone upon its richness in butter fat; purity, sweetness, and fine flavor are qualities it should possess.

16. *The Oil Test Churn.*—The oil test churn is used to determine the quantity of churnable fat in each supply of every patron's cream. The requirements for its successful use are:

a. Careful sampling of the cream, which should be poured at least twice from one vessel to another before the sample is taken for the test tube.

b. Accurate measuring.

c. Souring of the cream (to insure a uniform degree of acidity in all the samples of cream, they should be warmed to 70° F. and kept at that temperature for twenty-four hours before they are churned).

d. Heating of the samples to a temperature of 135° F. after they have been churned.

e. Subsequent cooling at 65° or 70° F.

f. Churning, reheating and cooling.

17. In a case where the butter oil on any sample does not separate to show a clear line or demarkation between itself and the other constituents of the cream, the cooling to 70°, the churning and reheating should be repeated.

Butter Making in Dairies and Creameries.—18. When shallow open pans are used for setting, the surrounding air should be pure; a damp, musty cellar is no fit place for milk.

19. The cream for each churning should all be gathered into one vessel and kept cool and sweet. A good practice for fall and winter is to mix 25% of pure water with the cream before it has become sour.

20. The whole of it should be well stirred every time fresh cream is added, and half a dozen times besides.

21. Two days before the churning is to be done about 1 qt. of cream for every 4 pailfuls to be churned—or a quantity equal to 2%—should be set apart and kept as warm as 70° Fah.

22. One day before the churning, that small quantity of cream called a fermentation starter, which will then be sour, should be added to the quantity which is intended for churning and be mixed therewith.

23. It should afterward be kept at a temperature of 60° Fah.

24. During summer the best churning temperature is 57° or 58°; during late fall and winter 62° to 64° are found to be preferable.

25 The agitation of churning should be kept up till the butter comes into particles larger than clover seed.

26. The buttermilk should then be drawn off and pure water at 55° added in its place.

27. By churning this for a minute or two the butter will be washed free from milk while it is still in a granular state.

28. The milky water may then be drawn off and replaced by a weak brine at the same temperature.

29. After a minute's churning the butter may be left to drain in the churn for half an hour before it is removed to be pressed and salted.

30. Pure salt of medium fineness and with a body velvety to the touch should be used.

31. ¾ oz. to 1 lb. will be the right quantity for most markets for immediate consumption, and 1 oz. to 1 lb. for packed butter.

32. The butter should be kept cool during the working and also during the few hours while it may be left for the salt to dissolve.

33 As soon as the salt is dissolved, the butter may be worked the second time to correct any streakiness which the first mixing of salt may have caused.

34. It should then be put up neatly and tastefully, with as little crimping and beautifying as feminine fondness for these will permit.

Roll Butter.—1. Butter is susceptible to odors or flavors in the surrounding air; it should be kept in a place where the air is pure.

2. If it is to be forwarded to the consumers' market in rolls, it should be handled as little as possible. Every handling adds "mussiness" to the appearance and consequently depreciates its value.

3. Each roll should be wrapped in a clean butter cloth, which has been soaked in a strong brine made up from 16 parts of salt and 1 part each of white sugar, saltpeter and borax, dissolved in water.

4. *Packing Butter.*—Butter which is being collected for packing may be kept in fair condition in a clean box; a better plan is to have it immersed in pure, strong brine.

5. In assorting it, more regard should be paid to similarity of body and flavor than to likeness in the shade of color.

6. The mixing table or butter worker needs to be kept particularly clean; after it has been thoroughly washed with borax water, it should be scalded and then cooled with cold water.

7. The butter should be worked at a temperature which will prevent it from becoming greasy. The temperature at which it is worked or mixed has more effect on the grain and body of the butter than the movements to which it is subjected can have. The cool atmosphere of early morning, and a supply of cold water in which to float the butter, will meet the needs of the case.

8. Only such packages as have a clean, neat appearance should be used.

9. The top of the butter should be covered with a clean butter cloth, prepared in the same way as that for the wrapping of roll butter

10. A covering plaster made of wet salt should be put over the cloth to a thickness of ½ in. or more.

11. Butter in tubs and kegs should be brined frequently; the salt covering should not be allowed to become quite dry; a brine similar to that which has been mentioned for use on butter cloths may be used freely with good results.—*From the Bulletin of the Canadian Dairy Commissioner, Experimental Farm, Ottawa.*

Butter, to Preserve.—The best method to preserve butter from the air is to fill the pot to within an inch of the top, and to lay on it common coarse-grained salt, to the depth of ½ an in. or ¾ of an inch., then to cover the pot up with any flat article that may be convenient. The salt by long keeping will run to brine, and form a layer on the top of the butter, which will effectually keep out the air and may at any time be very easily removed by turning the pot on one side. Fresh butter, 16 lb.; salt, 1 lb.; fresh butter, 18 lb.; salt, 1 lb.; saltpeter 1¼ oz.; honey or fine brown sugar, 2 oz.

To Convert Rancid Butter.—100 lb. of butter is mixed with about 30 gal. of hot water, containing ½ lb. of bicarbonate of soda and 15 lb. of fine granular animal charcoal free from dust, and the mixture is churned together for half an hour or so. The butter is then separated; after standing, warmed and strained through a linen cloth, then resalted, colored and worked up with one half its weight of fresh butter.

To Sweeten Rancid Butter.—Rancid butter may be restored, or at all events greatly improved, by melting it with some freshly burnt and coarsely powdered animal charcoal (which has been thoroughly freed from dust by sifting) in a water bath, and then straining it through clean flannel. A better and less troublesome method is to well wash the butter with some good new milk, and next with cold spring water. Butyric acid, on the presence of which rancidity depends, is freely soluble in fresh milk.

To Test Butter with the Microscope.—When pure butter is examined under the microscope, the whole field is filled with extremely fine globules, which are entirely destitute of any approach to crystalline form. If the butter is artificial or a mixture of both, the field presents numerous angular or acicular particles between the globules. For the chemical examination try the following: The butter to be examined (if in the form of butter) must be first melted and rendered pretty free from water and salt, by filtration if necessary; 10 grn. are then to be put into a test tube, and liquefied by placing the tube in hot water at about 150° F.; remove the tube when ready, and add 30 minims of carbolic acid (Calvert's No. 2 acid, in crystals, 1 lb.; distilled water, 2 fl. oz.) Shake the mixture, and again place it in the water bath until it is transparent. Set the tube aside for a time. If the sample thus treated be pure butter, a perfect solution will be the result; if beef, mutton or pork fat, the mixture will resolve itself into two solutions of different densities with a clear line of demarkation; the denser of the two solutions, if beef fat, will occupy about 49·7%, lard 49·6%, mutton 44% of the entire volume; when sufficiently cooled, more or less deposit will be observed in the uppermost solution. If olive oil be thus tested, the substratum will occupy about 56%; with castor oil there is no separation. With some solid fats (not likely to be used fraudulently) no separation whatever takes place; the addition of a minute portion of alkanet root will render the reading of the scale extremely distinct by artificial light. The author states that the above method (although not intended to surpass other processes) is capable of wide application; the saving of a large amount of time and the reliability of its results will at once recommend it as a "first step" in butter analysis.

To Test Butter.—The *Scientific American* recommends this simple test for oleomargarine: Stir a little—half a teaspoonful or less—of the

suspected butter in enough sulphuric ether to dissolve it. By the time the grease is dissolved the ether will have been evaporated, and the residuum will show, to smell or taste, whether it is butter, lard, or tallow. Five cents' worth of ether will suffice for several tests.

Button Metal. See **Alloys.**

Cabbage Worms.—Ice cold water sprinkled upon cabbage plants infested by the imported cabbage worm is claimed to be sure death to that insect. The water should be sprinkled upon the cabbages during the heat of the day, when the worms will roll off and die. The discovery of the remedy is credited to Mr. Charles H. Erwin, of Painted Post, N. Y., and is communicated by Prof. C. V. Riley.

Cacao, Butter of.—This is obtained from the nut by bruising it and boiling it in water. On the latter cooling, the oil floats and is skimmed off. Use, etc. As commonly met with it has the consistence of butter; hence its name. It is much used in perfumery and for burning in lamps. When mixed with a little caoutchoucine, or distilled spirit of India rubber, it loses its concrete form and assumes the limpidity of common oil, at the same time that its illuminating power is vastly increased.

Cacao Oil. See **Oils.**

Cachous, or Mouth Pastils.—They are largely used by smokers and persons with impure breath. The gilding or silvering is effected in the way usually adopted for pills, viz.: A leaf or two of gold or silver is placed in a gallipot; on this an appropriate number of pills or pastils, and then another leaf of the metal. The mouth of the gallipot is next covered with a piece of smooth writing paper, and on this the palm of the hand is placed, when a sudden and rapid circular motion is given to the whole for a second or two. Another method is to shake them, in a similar manner, with a little gold dust or silver dust. When pills are gilded or silvered immediately after being prepared, they are usually sufficiently moist or sticky to cause the leaf or dust to adhere; but should they be otherwise, they should be previously breathed on, or placed in damp air for a few minutes, or rubbed between the fingers or the palms of the hands, very slighly moistened with thin mucilage, so as to render them somewhat sticky, but not wet. Mouth pastils are preferably not coated until they are dry and hard, and hence generally require one or other of these modes of treatment. The products of the following formulæ are among those most highly esteemed:

1. Take of soft extract of licorice, 3 oz.; catechu, in fine powder, 1 oz.; white sugar, 1 oz.; gum tragacanth, ½ oz.; oil of cloves, 1 fl. drm.; oil of cassia, ½ fl. drm.; oil of nutmeg, essence of ambergris (royale), of each 12 drops; mix as before explained; beat the mixture to a firm uniform mass with eau de rose, or eau de fleurs d'oranges, q. s., and form it into 1 grn. or 2 grn. pills. Lastly, when dry, silver them. The stock of them should be kept in bottles or tin canisters, and only a sufficient number of boxes for present sale filled at once.

2. M. Chevallier.—Take of fresh roasted coffee in fine powder, 1½ oz.; chocolate, do., 1½ oz.; white sugar, do., 1½ oz.; vanilla, do., 1 oz.; charcoal (recent), do., 1 oz.; mucilage of tragacanth, to mix, q. s. The preceding, sucked *ad libitum*, are used to sweeten and perfume the breath; the last also acts by chemically deodorizing it. They are great favorites in the fashionable world among smokers.

3. Take of chloride of lime, good dry, 1 drm.; white sugar p wdered, 3 oz.; gum tragacanth, do., 1 oz.; mix; add of oil of cloves or peppermint, ½ fl. drm.; mix thoroughly and beat up the mass with rose water. This acts chemically as a disinfectant, deodorizer and bleacher, but should be only occasionally and sparingly used, as the chloride in them attacks the enamel of the teeth. One at a time is sufficient. The saliva should not be swallowed, and the mouth should be rinsed with water soon afterward.

4. Extract of licorice, 1 oz.; oil of cloves, ½ drm.; oil of cinnamon, 5 drops; moisten 1 grn. pills with this solution and silver.

5. Ground coffee, ¾ oz.; finely powdered charcoal, ½ oz.; sugar, ½ ounce.; vanilla, ½ oz.; mucilage, q. s. Make into lozenges.

Calcination.—The operation of burning or roasting any solid body to expel its more volatile parts, as the conversion of chalk into lime by the expulsion of carbonic anhydride. The roasting of the ores in the first stage of the Welsh process of copper smelting, and in the Silesian mode of extracting zinc, is technically termed calcination.

Calisaya Cordial for Soda Fountains.—1. Elixir of calisaya, 1 oz.; orange sirup, 3 oz.

2. Quinine sulphate, 72 grn.; cinchonine sulphate, 24 grn.; quinidine sulphate, 20 grn.; cinchonidine sulphate, 12 grn.; elixir orange, 128 fl. oz.; caramel sufficient to color. Triturate the mixed sulphates with one pint of the elixir of orange, pour the mixture into a glass flask, and heat on a water bath till solution is effected. When still hot, add remainder of elixir and caramel. Filter when cold.

Calisaya Tonic, Inexpensive.—Calisaya bark, 11 oz.; gentian root, 3 oz.; orange peel, 12 oz.; cochineal, 4 drm.; caraway seed, 2 drm.; dilute alcohol, enough to make 4 pt. To the filtered percolate add quinine sulphate, 30 grn.; oil of rose, 3 drops; sirup, enough to make 4 gal. In dispensing as a carbonated beverage it is best to draw "flat," that is without foam.

Camphine.—Name given to rectified oil of turpentine. Made by passing the vapor through solution of caustic potash or through sulphuric acid. Dangerous to burn in lamps.

Camphor.—A concrete essential oil obtained from distillation from the camphor laurel of China. It is crystalline in form, though it is also obtained in a liquid form from Borneo.

Camphor, Factitious.—Pass dry hydrochloric acid gas through pure oil of turpentine, cooled by a freezing mixture. A white crystalline mass is soon formed, which is dried between blotters, and purified by solution in alcohol.

Camphor Ice.—1. Oil of sweet almonds, 2 oz.; spermaceti, 4 oz.; white wax, 2 oz.; camphor, ½ oz.; melt them over a water bath, run in moulds of proper size and form.

2. Expressed oil of almonds and rose water, each, 1 lb. White wax and spermaceti, each, 1 oz. Camphor, 2 oz. Oil of rosemary, 1 drm. Melt together. Glycerine may be substituted in part for the oil and rose water.

Camphor, Naphthaline.—Melt on a steam bath 100 parts of camphor and 300 parts of naphthaline and pour into moulds. If a perfumed preparation is desired, add 0·2 part coumarin, 0·2 part neroline, and 1 part nitrobenzol.—*Pharm. Era.*

Camphor, Powdering.—According to *The Pharmacist*, the most efficient substance to keep camphor in a finely divided condition is glycerine: Camphor, 6 oz.; alcohol, 5 fl. drm.; glycerine, 1 fl. drm. Mix the glycerine with the alcohol, and triturate it with the camphor until reduced to a fine powder.

Camphor, Tincture of.—Take of camphor, 1 oz.; rectified spirit, 9 fl. oz.; dissolve. This is the formula of the new British Pharmacopœia. That of the London Ph. is 1 oz. of camphor to 8 fl. oz. of spirit. The *tinctura camphoræ* of the Edin. Ph. has only 1 oz. to 16 fl. oz. Used as an application to chilblains, and in mouth rinses, and as camphor drops, etc. It is

commonly sold as concentrated essence of camphor. The spirit of wine and camphor, and camphorated spirit, of the shops is a much weaker preparation.

Canceling Ink. See **Inks.**

Candles.—*Adamantine Candles.*—100 lb. of mutton tallow; 2½ lb. of camphor; beeswax, 4 lb.; alum, 2 lb.

Aromatic Candles.—For perfuming apartments.—Melt balsam of Peru and camphor with the material of which the candles are to be made; or the wicks may be steeped in some aromatic tincture and dried.

Cable, Twisted or Spiral Candles.—These are moulded in the ordinary way, and then turned by means of a special lathe; or they may be cast in rifled moulds, from which, on cooling, they are wound out.

Cerophane Candles.—Melt over a water bath 50 parts of stearic acid and 5 to 5½ parts of bleached beeswax. Let it remain over the water bath for one-half hour, but do not stir or agitate. Then allow the fluid to cool, until there is a slight film on the surface. Pour the mass into moulds, which have been heated to the same temperature, but avoid stirring.

To Coat Tallow Candles with a Hard Substance which will not Crack.—Dip the candles successively into the following three mixtures: 1. 4 parts white resin; 88 parts good tallow; 6 parts camphor; 20 parts stearic acid; 2 parts dammar resin. Melt.

2. 48 parts tallow; 6 parts camhpor; 20 parts stearic acid; 4 parts white pitch; 10 parts dammar resin. Melt together.

3. 20 parts stearic acid; 4 parts white wax; 10 parts tallow; 6 parts camphor. Melt.

Colored Candles.—Among the coloring matters used for candles are the following:

Blue: Prussian blue, indigo, ultramarine, copper sulphate, aniline blue. Red: Carmine, Brazil wood, alkanet root, minium, vermilion aniline reds. Yellow: Gamboge, chrome yellow, naphthaline yellow. Green: Mixture of blue and yellow colors. Purple or violet: Mixture of blue and red colors. Neutral Tints: Oxides of iron, yellow ocher, Frankfort black. Black: Fruit of *Anacardium occidentale*, aniline blacks. In order to dye paraffin candles with an aniline base, such as magenta, the dye is first dissolved in stearin, and a little of the resulting stearate is added to the paraffin.

There are two ways in which candles may be colored black: 1. Anacardium Method.—Paraffin, or whatever material is desired for the candles, is heated from 200° to 210° C. with 25% of its weight of the chopped fruit of *Anacardium occidentale*. Candles prepared in this way are equally black throughout, and yield no irritating vapors when burnt.

2. Aniline Method.—The material to be dyed is heated a few degrees above its melting point with 1 to 2% of nigrosine fat color (prepared by Destree, Wiescher & Co., of Brussels). Paraffin and spermaceti require 1%; stearin and wax require from 1½ to 2%. The candles thus prepared are said to be of a somber hue throughout, and of a jet black appearance.

Diaphane Candles.—Melt together in a steam jacket 5 lb. vegetable wax, 3 lb. pressed mutton tallow and 11 lb. stearic acid. The stearic acid and the vegetable wax are the hardening ingredients.

Home Made Candles.—Many of our readers in the rural districts will find that candles can be made economically by mixing a little melted beeswax with the tallow to give durability to the candle, and to prevent its running. The light from a tallow candle can be improved in clearness and brilliancy by using small wicks which have been dipped in spirit of turpentine and thoroughly dried.

Hygienic Candles.—Watson and Fulton prepare these by incorporating iodine and a small quantity of sulphur with the candle material, and they consider that during the combustion the iodine and sulphur are both eliminated in the free state, according to the equation:

$$4\,HI \times SO_2 = I_4 + S + 2H_2O$$

Lard Candles.—1. Dissolve 1 lb. alum and 1 lb. saltpeter in 2 qt. water over a slow fire; 12 lb. lard are added. The stirring must be kept up continually until all the lard is dissolved. Do not leave on the fire too long, as the lard is liable to be discolored. It is said that these candles are superior to tallow.

2. Solid Candles from Lard.—Cut 16 lb. lard in small pieces, put in a pot with ½ lb. alum and ½ lb. saltpeter (previously dissolved in 1 pt. water, over a slow fire). Stir constantly over a slow fire until all the lard is dissolved. Allow to simmer until the steam ceases to rise, then remove from the fire. These candles are harder than those made from tallow.

Mutton Suet Candles in Imitation of Wax.—Throw quicklime in melted mutton suet; the lime will fall to the bottom, and carry along with it all the dirt of the suet, so as to leave it as pure and as fine as the wax itself. Now, if to 1 part of the suet you mix 3 parts of real wax, you will have a very fine, and, to appearance, a real wax candle; at least the mixture could never be discovered, nor even in the moulding of wax ornaments.

Mercurial Candles.—Red sulphide or gray oxide of mercury mixed with wax, and a wick of cotton inserted therein. Recommended by Mr. Collis for partial mercurial fumigation. They are burnt under a glass funnel with a curved neck, the upper orifice of which is directed to the diseased part.

Candles, Roman. See **Pyrotechny.**

Candles, Scented or Aromatic.—These are prepared by introducing a very small quantity of any appropriate aromatic into the material (fat, wax or wick) of which they are made, while it is in the liquid state. Camphor, gum benzoin, balsam of Peru, cascarilla, essential oils, etc., are generally the substances selected. Care must be taken not to overdo it, as then the candles will burn smoky and give little light.

Candles with Snuffless Wicks.—The great objection to tallow candles is the frequent necessity for removing the snuff, or charred wick, which rises into the body of the flame and obscures the light. If the wick can be exposed to the air, it will be entirely consumed. 1. This is done in composite candles by plaiting the cotton into a flat wick, which as it burns curves over. Sometimes a very fine wire is included in the wick, which is usually dipped in a solution of borax. 2. Twist the wick with one strand shorter than the others, which will bend the wick slightly when the fat melts.

Spermaceti Candles.—Spermaceti, either alone or combined with hard white tallow, forms very good candles, but they will not bear carrying about in the hand without spilling the melted portion.

Stearine Candles.—These are made of the stearine of stearic acid obtained from tallow, in the same way as other mould candles. They furnish a superior light and burn a long time; three or four years ago it was a general practice for the manufacturer, to add a little arsenious acid (white arsenic) to the stearine, to prevent it crystallizing, and thus spoiling the appearance of the candle; but owing to the spirited way in which this rascality was exposed by the press, it has been discontinued by all the respectable houses.

Tallow Candles.—To make hard tallow candles, use a mixture of mutton tallow, 10 oz.; camphor, ½ oz.; beeswax, 4 oz.; and alum, 2 oz.

Tallow Candles, to Harden.—Dip first in the following: Stearic acid, 50 parts; tallow, 44 parts; camphor, 3 parts; white resin, 2 parts; gum dammar, 1 part. When hard dip in other solution, which consists of 70 parts stearic acid; tallow, 24 parts; camphor, 3 parts;

white wax, 2 parts; gum dammar, 1 part. For a final coating dip in 90 parts stearic acid; 5 parts of tallow; camphor, 3 parts; white wax, 2 parts.

Tallow Candles, to Make.—The ingredients are about ⅓ beef and ⅔ mutton suet. The use of 1 lb. of alum with each 5 lb. of tallow is recommended. Dissolve the alum in water, then put in the tallow, and stir until both are melted together, then run in moulds. This part of the operation is conducted as follows: The wicks are secured in the center of each mould by passing over the sticks, one of which is laid over the top of the mould (corresponding to the bottom of the candle) and the other against the bottom points of the moulds. The end of the twisted wick is fastened to the stick on the top of the mould, and is drawn by a piece of hooked wire through each mould in succession, leaving a loop outside the bottom points of the mould; the loops are secured there by the bottom stick passing through them; the wicks are to be drawn tight, and the last end tied to the upper stick. The melted tallow is then poured into the moulds and allowed to stand about six hours in a cool place, after which the bottom stick must be taken out of the loops and the candles withdrawn from the moulds. The tallow should not be heated much more than is necessary to melt it.

Wax Candles.—These are made either by pouring melted wax over the wick or by applying the wax in a soft state with the hands, and afterward rolling it smooth with a roller of polished boxwood, upon a table formed of polished walnut wood. They are then cut and trimmed. The first part of this process is usually conducted over cisterns of melted wax, and the wicks are strung upon an iron hoop suspended from the ceiling.

Imitation Wax Candles.—To tallow, purified by throwing powdered quicklime in it when melted, add 1 part of wax to ⅛ part tallow. This makes a beautiful candle resembling wax. Put 1 oz saltpeter and ½ lb. of lime in 2 qt. of water. Dip the wicks in this. This prevents the tallow from running, and also improves the light.

Candle Wicks, Preparing.—To improve the light, and prevent the tallow from running, use the following preparation: 1. Steep the wicks in a solution of lime water to which saltpeter has been added in the proportion of 1½ gal. water, 3 oz. saltpeter, ¾ lb. lime. Dry the wicks before using.

2. Borax 3 oz., calcium chloride, saltpeter and chloride ammonium, each 1½ oz.; dissolve in 4½ qt. water, and filter. Soak the wicks in this solution, then dry.

Cans, Tin.—Size of sheet for from 1 to 100 gal.:

For	1 gal.	1x20 in.	For	25 gal.	30x56 in.
"	3½ "	10x28 "	"	40 "	36x63 "
"	5 "	12x40 "	"	50 "	40x70 "
"	6 "	14x40 "	"	75 "	40x84 "
"	10 "	20x42 "	"	100 "	40x98 "
"	15 "	30x42 "			

This includes all the laps, seams, etc. Is sufficiently correct for all practical purposes.

Canvas, to Prepare for Painting.—1. Nail the canvas on the stretcher, then give it a coat of thin glue size. Allow this to dry, then apply paint of the desired tint with a palette knife. The paint should have about the consistency of that sold in artists' tubes.

2. 1 part white lead, 2 parts whiting; a small portion of litharge and sulphate of zinc for driers; mix with equal parts of boiled linseed oil and raw linseed, tinted with either brown umber or lamp black, for a neutral ground. The canvas is tacked upon a stretching frame, and sized with weak glue size, to which a small portion of zinc sulphate is added. When dry it is stippled over with some driers and raw linseed oil, as thin as possible, not saturated. When very near dry the white lead, whiting, etc., is mixed up very smooth, and put upon it very thin and smooth with a large palette knife, and hatched over with a large sash tool, drawing it across one way and then at right angles until the face presents a face like a piece of fine linen or cartridge paper when it is left to dry.

Cantharides, Tincture of. See **Tinctures.**

Canvas, to Protect from and Remove Mildew. See **Cleansing.**

Canvas, to Renovate. See **Cleansing.**

Canvas, to Waterproof. See **Waterproofing.**

Caoutchouc Cement. See **Cements.**

Caoutchouc, Metallized.—Finely powdered metals may be mixed with the pure gum before vulcanization. See also **Rubber.**

Capacity, Measures of. See **Appendix.**

Capsules.—These articles are usually prepared by dipping the bulbous extremity of a metallic rod into a strong solution of gelatine. When the rod is withdrawn it is rotated in order to diffuse the fluid jelly equally over its surface. As soon as the gelatinous film has hardened it is removed from the mould and placed on pins, furnished with suitable heads, and fixed on a cork table. When dry, the capsules are placed upright in little cells, made in the table to receive them, and the liquid with which they are to be filled is then introduced by means of a small glass tube. They are next closed by dropping some of the solution of gelatine on the orifices.

Gelatine Capsules.—Dissolve in a water bath 10 parts of gelatine; 2½ parts of sugar; 1¼ parts of gum arabic in 10 parts of water. Take iron pins, the lower ends of which are pear shaped and slightly oiled, dip in this solution when it is lukewarm. When the gelatine films are congealed, detach them, and place in holes of the same size in wooden forms, to dry. The capsules are filled with the desired medicine and closed with a drop of the same solution.

Caramel.—A dark brown substance obtained by heating sugar. It is formed during the roasting of all materials containing sugar, such as coffee and malt. It is much used for coloring soups, wines, spirits and other liquids.

Carbolic Acid, Perfumed.—Carbolic acid, 4 oz.; rectified spirit, 6 oz.; oil of bergamot, 28 min.; oil of citronella, 10 min.; water, to make 1 pt. Dissolve the oils and acid in the spirit, and add the water, shaking well.

Carbonade or Black Diamond.—An uncrystallized variety of carbon, found in Brazil. It is as hard as the diamond, but free from its liability to split. It is used for turning down and truing emery wheels.

Carbon, to Cut.—Gas carbon can be cut with an old saw and a large expenditure of labor and patience. Fix the carbon in a vise, keep it moist with water, and saw away. You may use a strip of sheet iron, or of iron hoop held in a frame like a hack saw, or a revolving disk of the same metal, instead of a saw, and in this case employ wet sand in the cut as an auxiliary.

Carbon Ink. See **Inks.**

Carbon Paper. See **Paper.**

Carbon, Plastic, for Filters.—(Kletzinsky.) 1. 60 parts coke; 20 parts animal charcoal; 10 parts wood charcoal; 10 parts pipe clay.

2. 10 parts coke; 30 parts animal charcoal; 20 parts wood charcoal; 40 parts short asbestos. The ingredients, except the last, are pulverized, sifted, and mixed dry, when kneaded with an equal weight of molasses to a plastic mass,

baked in a muffle, soaked in dilute muriatic acid, washed, dried and baked again.—*Scientific Record*, 1874.

Carbon Plates, to Make.—Select bright, clean coke, pulverize it finely. Mix with it a small proportion of finely ground bituminous coal and pour into a mould. Put the mould into an iron box and heat to redness in a muffle for several hours. When cool soak in thin molasses and bake as before.

Carbon and Porous Cups, Care of.—After long use the porous cells and the carbons should be soaked in warm water.

Cardboard, Snowflake Appearance on.—Mix with a very concentrated aqueous solution of good clean table salt enough of a warm aqueous solution of dextrine to make a very thin mucilage. Apply this with a wide soft brush to the cardboard—the thinnest possible coating is all that is required. Sulphate of magnesia, acetate of soda, and stannous sulphate are employed in a similar manner.

Carmine. See **Pigments.**

Carpets, to Clean. See **Cleansing.**

Carpets, Substitute for. See **Papier Mache.**

Carriages, to Preserve. See **Cleansing.**

Carton Pierre Ornaments.—The following is a formula for such a composition: Glue, previously dissolved in water, 13 parts; pulverized litharge, 4 parts; white lead, 8 parts; plaster of Paris, 1 part; very fine sawdust, 10 parts. Oil the moulds in which it is cast to prevent adhesion.

Casehardening Iron.—1. Iron may be casehardened, that is, the surface converted into steel and hardened, as follows: First, by the common prussiate of potash process, which is as follows: Crush the potash to a powder, being careful that there are no lumps left in it, then heat the iron as hot as possible without causing it to scale; and with a piece of rod iron, spoon shaped at the end, apply the prussiate of potash to the surface of the iron, rub it with the spoon end of the rod until it fuses and runs all over the article, which must then be placed in the fire again and slightly reheated, and then plunged into water, observing the rules given for immersing steel so as not to warp the article. Another method is to place the pieces to be hardened in an iron box made airtight by having all its seems covered well with fire clay, filling the box in with bone dust closely packed around the articles, or (what is better) with leather and hoofs cut into pieces about an inch in size, adding thin layers of salt in the proportion of about 4 lb. salt to 20 lb. of leather and 15 lb. of hoofs. In packing the articles in the box, be careful to so place them that when the hoofs, leather, etc., are burned away, and the pieces of iron in the box receive the weight of those above them, they will not be likely to bend from the pressure. When the articles are packed and the box ready to be closed with the lid, pour into it 1 gal. of urine to the above quantities of leather, etc.; then fasten down the lid and seal the seams outside well with clay. The box is then placed in a furnace and allowed to remain there for about twelve hours, when the articles are taken out and quickly immersed in water, care being taken to put them in the water endways to avoid warping them. Articles to be casehardened in the above manner should have pieces of sheet iron fitted in them in all parts where they are required to fit well and are difficult to bend when cold. Suppose, for instance, it is a *quadrant for a link motion*: fit into the slot *where the die works* a piece of sheet iron (say ¼ *in.* thick) at each end of the slot, and two other pieces at equidistant places in the slot, leaving on the pieces a projection to prevent them from falling through the slot. In packing the quadrant in the box, place it so that the sheet iron pieces will have their projections uppermost; then in taking the quadrant out of the box, handle it carefully, and the pieces of iron will remain where they were placed and prevent the quadrant from warping in cooling or while in the box, from the pressure of the pieces of work placed above it. It is obvious from what has been already said that the heavier pieces of work should be placed in the bottom of the box.

2. Casehardening Small Articles.—Take a length of gas pipe of from 6 to 12 in. and of suitable diameter, screw on thimble caps, and pack the screws in them with bone dust, or with equal parts of charcoal dust and unslaked lime; heat to a red for two hours, then chill in cold water. A charcoal or a coke fire is best; anthracite will do, but bituminous coal is objectionable.

3. Pack the articles to be casehardened in an iron box filled with bonedust, or animal charcoal made of burnt leather. For small articles short pieces of gas pipe will do instead of an iron box. The ends must be stopped and luted with clay. The leather may be burnt in a pan or in stove, and it must be reduced to powder before being packed around the work. Heat the receptacle and the contained work red hot, in a furnace, for a length of time proportionate to the size and thickness of the articles. Thin articles will reduire to be kept at a red heat only a few minutes, while heavy articles may require half an hour or more. When sufficiently heated, quench the work as soon as possible in cold water.

4. Common Prussiate of Potash Process.—Crush the potash to a powder, being careful that there are no lumps left in it, then heat the iron as hot as possible without causing it to scale; with a piece of rod iron, spoon shaped at the end, apply the prussiate of potash to the surface of the iron, rub it with the spoon end of the rod until it fuses and runs all over the article, which must then be placed in the fire again and slightly reheated, and then plunged into water, observing the rules given for immersing steel so as not to warp the article.

5. Casehardening to be quickly performed is done by the use of prussiate of potash. This is powdered and spread upon the surface of the piece of iron to be hardened, after the iron is heated to a bright red. It almost instantly fluxes or flows over the surface, and when the iron is cooled to a dull red it is plunged into cold water. Some prefer a mixture of prussiate of potash 3 parts, sal ammoniac 1 part; or prussiate 1 part, sal ammoniac 2 parts, and finely powdered bone dust (unburned) 2 parts. The application is the same in each case. Proper casehardening, when a deep coating of steel is desired, is done by packing the article to be hardened in an iron box with horn, hoof, bone dust, shreds of leather or raw hide, or either of these, and heated to a red heat, for from one to three hours, then plunged in water.

6. Casehardening Compound.—Sal soda, 27 parts; lampblack, 24 parts; sodium chloride, 6 parts; black oxide manganese, 1½ parts.

7. Prussiate of potash, 20 parts; saltpeter, 20 parts; sal ammoniac, 20 parts; pulverize, and mix thoroughly. Heat the case iron to a cherry heat and roll it in the above composition, taking care to touch every part of the surface. Plunge while hot in a bath containing 3 oz. prussiate of potash and 6 oz. sal ammoniac to each 1½ gal. of cold water.

8. Take some good charcoal (from oak the best); also some marble (carbonate of lime). Mix together, the marble having been broken small. Then lay the tool or other piece to be casehardened in this compound, in a covered box, and subject it to good and continuous heat. Result: a deep penetration of the carbon into the iron, and therefore a coating of steel. In other words, the outer cuticle has

been converted into steel by the process of cementation.

9. To economize in the more expensive materials for casehardening cast, wrought, or malleable iron, and to harden only portions of the article in the different degrees, if required, Gracie Roberts, of Brooklyn, makes use of an improved method. After polishing the surface, he glues to the portion to be casehardened a coating of yellow prussiate of potash. A number of coats are given, according to the degree of casehardening required. A cheaper material, or simply boneblack, is used where a slight effect only is required. When the glue is set hard, the article is packed in powdered charcoal, heated to redness in a quick fire, and maintained at that heat for half an hour. Then it is hardened and tempered in the usual manner.

10. Casehardening Powders.—I. Prussiate of potash dried and powdered. II. Prussiate of potash, 3 parts; sal ammoniac, 1 part; mix. III. Sal ammoniac and bone dust, of each 2 parts; prussiate of potash, 1 part; mix.

11. Casehardening Compound (King).—A mixture said to be very efficacious for casehardening iron consists of 16 parts of lampblack, 18 parts sal soda, 4 parts muriate of soda, 1 part black oxide of manganese.

12. Axle Arms.—Instead of using 1 large pan and plunging ½ doz. arms into it, have a round conical box for each arm, made of old boiler plate, ⅜ in. thick, about 2 in. or 3 in. longer, and about 2½ in. larger in diameter inside than the arm. Into the box place sufficient animal charcoal to raise the collar of the axle arm nearly flush with the top of the box, then surround the arm with the charcoal as far up as the collar, ramming it firmly down as you proceed, and finally cover the top of the charcoal with fire clay, taking care to plaster well the clay round the axle and the edge of the box. The furnace is a small reverberatory one, capable of holding 8 to 12 of these boxes at the same time. The boxes are allowed to remain in the furnace one to two hours, according to the size of the axles, etc.

13. Thin Steel Plates.—Cool them off between two flat gratings of cast iron, having small surfaces of contact.

Casein. — This substance constitutes the chief nitrogenized substance in milk. It is used occasionally in the arts, as for the manufactureof case in cements.

Casein Cement. See **Cements.**

Casein Glue. See **Glues.**

Casein Mucilage. See **Mucilages.**

Casks, Musty.—Have the casks well scrubbed with boiling liquor, in which a little soda ash has been dissolved. If they are not wanted for immediate use, let them stand exposed to the air, one head out, for a month. There is no greater purifier than the atmosphere; then head up, slightly steam, blow off, and send to cellar to be filled. If wanted for use, scrub, then gently fire until well hot through, steam, etc., as before. They should all be tested for sweetness, by chipping and smelling, before being headed up. If not wanted for use, when finished put about a pint of bisulphite of lime and water, 1 to 4 of water, and they will keep good in a cellar for twelve months. See also **Barrels.**

Castings, Cement for. See **Cements.**

Castings, Composition for Filling. See **Compositions.**

Castings, Contraction of.—By Messrs. Bowen & Co., brass founders, London.

	Inch.	Inches of length.
In thin brass castings,	1/8	in 9
In thick " "	1/8	in 10
In zinc castings,	5/64	in 12
In lead, according to purity,	3/16 to 5/16	in 12
In copper, " "	1/8 to 3/16	in 12
In tin, " "	1/32 to 1/16	in 12
In silver, " "	1/8	in 12
In cast iron, according to purity, small castings,	1/10	in 12
In cast steel, according to purity, pipes,	1/8	in 12

The above values fluctuate with the form of pattern, amount of ramming, and temperature of metal when poured. Green sand castings contract less than loam or dry sand castings.

Castings, Shrinkage of.—Shrinkage of castings in locomotive cylinders, 1/10 in. in a foot; in pipes, 1/8 in. in a foot; girders, beams, etc., 1/6 in. in 15 in.; engine beams, connecting rods, etc., 1/8 in. in 16; thin brass, 1/8 in. in 9; thick brass, 1/8 in. in 10; in zinc, 5/64 in. in a foot; in lead, same; in copper, 1/16 in. in a foot; in bismuth, 5/32 in. in a foot; in tin, 1/4 in. in a foot.

Catalysis.—This term is applied to substances which effect a chemical change by their mere presence; thus in the manufacture of oxygen, manganese dioxide is used, but it is all recovered unchanged.

Catarrh Remedy, Dr. Sage's. — Dr. Sage's catarrh remedy, says Schadler, contains 0·5 grm. of carbolic acid, 0·5 grm. camphor, and 10 grm. common salt, which are to be dissolved in ½ liter of water and injected into the nostrils. It appears very probable that the wide reputation of this remedy is a deserved one, and the publication of its constituents will rather increase than retard its sale.

Catarrh Cure, Hall's.—A correspondent of the *Druggists' Circular* gives the composition: Take of potassium iodide, 1 drm.; comp.

Castings, Weight of.—

Table giving Proportionate Weight of Casting to Weight of Wood Pattern.

By Messrs. Bowen & Co., Brass Founders, London.

A pattern weighing one pound made of (less weight of core prints)	Cast Iron.	Brass.	Copper.	Bronze.	Bell Metal.	Zinc.
	lb.	lb.	lb.	lb.	lb.	lb.
Pine or fir will weigh in	14	15·8	16·7	16·3	17·1	13·5
Oak " "	9	10·1	10·4	10·3	10·9	8 6
Beech " "	9·7	10·9	11·4	11·3	11·9	9·1
Linden " "	13·4	15·1	16·7	15·5	16·3	12·9
Pear " "	10·2	11·5	11·9	11·8	12·4	9·8
Birch " "	10·6	11·9	12·3	12·2	12·9	10·2
Alder " "	12·8	14·3	14·9	14·7	15·5	12·2
Mahogany " "	11·7	13·2	13·7	13·5	14·2	11·2
Brass " "	0·84	0·95	0·99	0·98	1·0	0·81

tinct. cardamom, 4 fl. oz.; comp. tinct. gentian, 12 fl. oz.; caramel, enough.

Catechu.—Cutch, gambir (formerly called terra japonica). These dye wares are the juices of certain trees evaporated down to dryness. The trees from which they are mainly obtained are the Acacia catechu of the Malabar coast and the Uncaria gambir of Peru. A certain quantity is also manufactured from the nuts of Areca catechu. This is the finest kind.

Caterpillars, to Destroy.—There are no fewer than nineteen insect enemies of the grape, and of these, seven or eight assume the caterpillar form at some stage of their development. If the fruit has not been formed, they may as a general thing be destroyed by sprinkling the vines with a solution of Paris green or London purple with water, say a heaping tablespoonful of the former to two gallons of the latter. The vines may be dusted with a mixture of the poisons and plaster or flour, in the proportion of 1 to 100. After the fruit has formed, a kerosene soap emulsion sprinkled on the vines would be destructive to the pests without endangering human life. Take about 4 lb. of common yellow bar soap, 1 gal. of kerosene and 1 gal. of water; heat the mass over the stove, stirring it till it forms a homogeneous thick yellowish liquid, then remove the mixture from the stove and continue the stirring until it becomes cool. This should be largely diluted with warm soft water, and it will be permanent. Pyrethrum powder mixed with plaster is also used to good effect, sprinkled on the vines.

Catgut.—Catgut is the name applied to strings, made chiefly from the intestines of sheep, used for harp, violin, guitar and bow strings, hatters' strings, etc. It is said that the best strings are made in Naples, because the Italian sheep, from their leanness, afford the best raw material—the membranes of lean animals being tougher than those of animals in high condition. The same name is also given to a species of linen or canvas with wide interstices.

Cathartics.—Syn. Purgatives. These have been divided into 5 orders or classes, according to their particular actions. The following are the principal of each class: I. (Laxatives, lenitives, or mild cathartics.) Manna, cassia pulp, tamarinds, prunes, honey, and phosphate of soda; castor, almond and olive oils; ripe fruit. II. (Saline, or cooling laxatives.) Epsom salts, Glauber salts, phosphate of soda (tasteless salts), seidlitz powders, etc. III. (Active cathartics, occasionally acrid, frequently tonic and stomachic.) Rhubarb, senna, aloes, etc.

Catsup, Mushroom.—Sprinkle the trimmed tops with salt, stir them occasionally for two or three days, then slightly press out the juice; add to each gal. of this ½ oz. each of bruised mustard seed and cloves and 1 oz. each bruised allspice, black pepper, and gently simmer for an hour in a porcelain-lined iron vessel; cool, strain, and bottle.

Catsup, Walnut.—Walnut shell juice, 3 gal.; salt, 7 lb.; ginger, 8 oz.; shallots, 8 oz.; garlic, 8 oz.; horseradish, 8 oz.; essence of anchovies, 1 qt.; mix.

Cattle Food, Spiced.—Locust bean meal, 6 cwt.; Indian meal, 10 cwt.; linseed cake meal, 3 cwt.; sulphur, 1 qr. 12 lb.; saltpeter, 1 qr. 12 lb.; common salt, 1 qr. 2 lb.; fenugreek, 20 lb.; gentian, 10 lb.; sulphate of iron, 5 lb.; anise seed, 4 lb.; ginger (ground), 3 lb.; total, 20 cwt. 1 qr. 12 lb.

Cauline.—A color obtained from red cabbage, red beets, and some other vegetables.

Caustics.—Substances which destroy or corrode the skin. Nitrate of silver (lunar caustic), caustic potash, nitric and acetic acids, quicklime, are all caustics, and should be used with caution.

Ceilings.—Ceilings that look very rough and manifest a tendency to peel should be gone over with a solution of 1 oz. alum to 1 qt. water. This will remove the superfluous lime and render the ceiling white.

Ceilings, Cracked, Filling for.—Whiting mixed with glue water or calcined plaster and water makes a good putty for filling cracks in plastered ceilings.

Céleri, Crême de. See **Liquors.**

Celluloid, Cement for. See **Cements.**

Celluloid, to Clean. See **Cleansing.**

Celluloid, Polishing. See **Polishing.**

Celluloid, Printing upon.—Dissolve the coloring substances in vinegar essence, acetic ether, or acetic acid. This prevents the color from running. This may not prove sufficient with all kinds of celluloid. In such case moisten with oil of turpentine or melted turpentine wax.

Celluloid, to Work.—In general celluloid is worked the same as horn or ivory. In turning the tool should be kept cool with water. In case the work tears, heat the celluloid in water until 90° to 100° F. are reached.

Celluloid, Cement for.—25 parts of shellac are dissolved in 25 parts of spirit of camphor and 100 parts 90% alcohol are added. 2. Fine celluloid shavings are dissolved in 90% alcohol. The celluloid companies sell an excellent cement for celluloid.

Cementation.—When metallic matter is heated without melting in contact with an oxidizing reagent, so that certain impurities are oxidized by the gas slowly penetrating the mass, little by little, the process is an "oxidizing cementation," as in the production of malleable cast iron. When wrought iron is strongly heated in contact with carbon or carbonaceous matter, it gradually unites with a portion of the carbon, converting the iron into steel. This is a "carburizing cementation." Cementation, then, is the reaction which takes place between two bodies without fusion.

Cements.—The importance of cements both in the workshop and in the household is universally acknowledged; but the frequency of failures in the use of them shows that no matter how good the receipt, or how carefully compounded, if the cement is carelessly applied or allowed an insufficient time for setting, bad results are sure to follow. By observing the following simple rules much time and money can be saved:

1. See that the surfaces are clean. Dirt and grease are sure to breed trouble. Wash the article with lye (caustic potash), or if from the nature of the substance lye cannot be used, with carbon bisulphide. The hands are very liable to be greasy, and the edges to be joined should not be touched by them. If the substances to be united have been joined before, all traces of the former cement must be removed.

2. Bring the cement into intimate contact with the surfaces to be united. This is best done by heating the pieces to be joined in those cases where the cement is melted by heat, as in using resin, shellac, marine glue, etc. This heating is of great importance and is usually neglected, to the detriment of the strength of the joint. This fact is understood by cement peddlers, and some of the really marvelous feats performed by them are entirely owing to this cause. Where solutions are used, the cement must be well rubbed into the surfaces, either with a soft brush (as in the case of porcelain or glass), or by rubbing the two surfaces together (as in making a glue joint between two pieces of wood).

3. As little cement as possible should be allowed to remain between the united surfaces.

To secure this the cement should be as liquid as possible (thoroughly melted if used with heat), and the surfaces should be pressed closely into contact (by screws, weights, wedges, or cords) until the cement has hardened. These mechanical aids also help to displace the thin film of air which sticks closely to the substance. The ordinary carpenter's hand screw is recommended for use with cements. It is in use by all cabinet makers and carpenters for gluing. A string tightly bound about the object answers the same purpose and is good if tight. All excess should be removed from the edges while the cement is still liquid. Plenty of time should be allowed for the cement to dry or harden, and this is particularly the case in oil cements, such as copal varnish, boiled oil, white lead, etc. When two surfaces, each half an inch across, are joined by means of a layer of white lead placed between them, six months may elapse before the cement in the middle of the joint has become hard. In such cases a few days or weeks are of no account; at the end of a month the joint will be weak and easily separated, while at the end of two or three years it may be so firm that the material will part anywhere else than at the joint. Hence when the article is to be used immediately, the only safe cements are those which are liquefied by heat and which become hard when cold. A joint made with marine glue is firm an hour after it has been made. Next to cements that are liquefied by heat are those which consist of substances dissolved in water or alcohol. A glue joint sets firmly in twenty-four hours; a joint made with shellac varnish becomes dry in two or three days. Oil cements, which do not dry by evaporation, but harden by oxidation (boiled oil, white lead, red lead, etc.), are the slowest of all.

4. Coloring matters may be introduced into cements with good effect. But care should be used not to mix anything with the cement which will set up any chemical action and so weaken the joint.

5. Select the right recipe from the following very full list of cements, which contains all which are of value and many which are published for the first time. The arrangement is such that they can be readily found either by their name or by their use. A good rubber cement, shellac varnish and a good gutta percha cement as the following should be on every amateur's work table.

A Strong and Handy Cement.—One of the strongest cements, and very readily made, is obtained when equal quantities of gutta percha and shellac are melted together and well stirred. This is best done in an iron capsule placed on a sand bath, and heated either over a gas furnace or on the top of a stove. It is a combination possessing both hardness and toughness—qualities that make it particularly desirable in mending crockery. When this cement is used, the articles to be mended should be warmed to about the melting point of the mixture, and then retained in proper position until cool, when they are ready for use.

For mending broken glass, china, wood and earthenware, the preparations generally used are the cements as follows: Armenian, Botany Bay, Cheese, Chinese, Curd, Egg, Extemporaneous, Glass, Glue, Hensler's, Hoenles', Mahogany and Parabolic. For spar, marble, and similar materials, the Alabaster cement is specially adapted; the Egg and Parabolic cements will, however, answer the same purpose. For cloth, leather, paper, card and light fancy work, the most suitable cements are the Elastic, Chinese, Flour, French and Japanese. The cements adapted for chemical and electrical apparatus, and for sealing bottles, are also termed Bottle, Cap, Chemical, Electrical, Laboratory, Maissiat's, and Varley's. The building and hydraulic cements are described under the heads Architectural, Beale's, Bruyere's, Fireproof, Gad's, Gibb's, Hamelin's, Hydraulic, Keene's, Oxychloride, Parker's, Pen's, Portland, Roman, Water, and Waterproof. The cements used for metal work, etc., in different trades are noticed under the heads Coppersmiths', Cutlers', Engineers', Grinders', Iron, Letter Fixing, Opticians', Plumbers', Seal Engravers', Steam Boilers, and Turners'. See **Glue, Lute, Mortar, Teeth,** *Cement,* **etc.**

Abolithe Cement.—A new cement, stated to possess excellent hardening qualities, is made by calcining magnesite (the carbonate of magnesia) in ovens similar to those used for gas making, after which it is pulverized and mixed with a quantity of fine silica. The cement is declared to possess great hardness and durability. It may be moulded like plaster; it may be used to reface the dilapidated stones of a building, and adheres with so much tenacity to wood that its application as a preserver of timbers, railway sleepers, etc., by painting it upon the surface, has been tried with success.

Acid-proof Cements.—1. Acid-proof cements are used for cementing troughs or other objects intended to hold acid.

2. For Galvanoplasty.—An oaken trough, close made, will last from twelve to fifteen years if coated with Burgundy pitch 1,500 grm., old gutta percha in shreds 250 grm., pounded pumice 750 grm. Melt the gutta percha, mix with the pumice, and add the pitch. A hot iron passed over the surface smooths it, and assists adhesion. The box resists sulphate of copper baths, but not cyanides.

3. Melt together 1 part pitch, 1 part resin and 1 part plaster of Paris (perfectly dry).

4. A good acid-proof cement is made by mixing a concentrated solution of silicate of soda with powdered glass, to form a paste. This is useful for luting joints in vessels exposed to acid fumes.

5. A mixture of China clay and boiled linseed oil, in the proportions needed to produce the right consistence.

6. Quicklime and linseed oil, mixed stiffly together, form a hard cement, resisting both heat and acids.

7. A stiffly mixed paste of pipe clay and coal tar.

8. A cement which, according to Dr. Wagner, is proof against even boiling acids, may be made by a composition of India rubber, tallow, lime and red lead. The India rubber must first be melted by a gentle heat, and then 6% to 8% by weight of tallow is added to the mixture while it is kept well stirred; next dry slaked lime is applied, until the fluid mass assumes a consistence similar to that of soft paste; lastly, 20% of red lead is added, in order to make it harden and dry.

9. Sulphur, 100 parts; tallow, 2 parts; resin, 2 parts. Melt, add sifted ground glass.

10. 1 part resin, 1 part sulphur, 2 parts brick dust; the whole is melted after careful mixing. This lute is proof against the attacks of nitric and hydrochloric acid vapors.

11. Melt 1 part of pure rubber in 2 parts of linseed oil; add 6 parts of pipe clay. This mixture produces a plastic cement which softens by heat, but does not melt.

12. Resin 3 lb., dried red ocher ½ lb., calcined plaster of Paris ¼ lb., linseed oil ⅛ lb. These must be incorporated by stirring together when melted.

13. Have boxes perfectly dry; smear them inside with a hot mixture of 4 parts resin, 1 part gutta percha, and a little boiled oil. The mixture must be thoroughly melted and stirred before use. A hot rod of iron may be used to melt it into the crevices. They can be used for any ordinary type of battery.

14. Melted India rubber alone answers well for securing joints against chlorine and some acid vapors.

Air and Water Tight Cement for Casks and Cisterns.—Melted glue, 10 parts; linseed oil, 5

parts; boil into a varnish with litharge. Hardens in two days.

Alabaster, to Mend (See also Marble).—1. Add ½ pt. vinegar to ½ pt. skimmed milk. Mix the curd with the whites of five eggs well beaten, and sufficient powdered quicklime sifted in, with constant stirring, so as to form a paste.

2. Plaster of Paris, resin (yellow), beeswax, equal parts.

3. Rice glue, thickened with finely powdered quicklime.

4. Yellow resin, 2 parts; melt and stir in 1 part plaster of Paris; resin, 8 parts; wax, 1 part; melt and stir in plaster of Paris.

A Cement Withstanding Alcohol.—Take the best kind of glue; pour on an equal quantity of water; let it soak overnight; next morning melt it over a gentle heat, and add fine Paris white or white lead; mix well, and add a little acetic acid, carbolic acid, oil of cloves, or any other ethereal oil, to prevent putrefaction. This cement is also adapted for flexible objects like leather. It will not withstand boiling water well, as this softens the glue.

Algerian Cement. See *Lutes, Algerian*, below.

Amber, to Cement.—1. Heat the surfaces and cement with boiled linseed oil. Shellac is also recommended. Clamp firmly.

2. Melt mastic in linseed oil. Use hot.

3. The *Canadian Pharmaceutical Journal* states that amber may be cemented by moistening the surfaces with solution of potash, and pressing them together.

Ammonia and Shellac Cement.—Finely powdered shellac, 1 part, is softened in 10 parts strong ammonia. This mass becomes fluid after a time. After applying to the rubber article the ammonia evaporates. Dissolves very slowly.

Aquarium Cement.—1. (Klein.) Mix equal parts of flowers of sulphur, pulverized sal ammoniac and iron filings with good linseed oil varnish, then add enough white lead to form a firm, easily worked mass.

2. Whiting, 6 parts; plaster of Paris, 3 parts; white beach sand, 3 parts; litharge, 3 parts; powdered resin, 1 part. Mix thoroughly, and make into a putty with the best coach varnish. Leave the glass a week before disturbing.

3. Linseed oil, 3 oz.; tar, 4 oz.; resin, 1 lb.; melt together over a gentle fire. If too much oil is used, the cement will run down the angles of the aquarium; to obviate this it should be tested before using by allowing a small quantity to cool under water; if not found sufficiently firm, allow it to simmer longer or add more tar and resin. The cement should be poured in the corners of the aquarium while warm (not hot). This cement is pliable, and is not poisonous.

4. Take 10 parts, by measure, litharge, 10 parts plaster of Paris, 10 parts dry white sand, 1 part finely powdered resin, and mix them when wanted for use into a pretty stiff putty with boiled linseed oil. This will stick to wood, stone, metal or glass, and hardens under water. It is also good for marine aquaria, as it resists the action of salt water. It is better not to use the tank until three days after it has been cemented.

5. Litharge, fine, white, dry sand, and plaster of Paris, each 1 gill; finely pulverized resin, ⅛ gill. Mix thoroughly and make into a paste with boiled linseed oil to which drier has been added. Beat it well, and let it stand four or five hours before using it. After it has stood for fifteen hours, however, it loses its strength. Glass cemented into its frame with this cement is good for either salt or fresh water. It has been used at the Zoological Gardens, London, with great success. It might be useful for constructing tanks for other purposes or for stopping leaks.

Architectural Cement.—1. Strong rice water size and paper pulped in boiling water are mixed together; enough whiting is then added to make it of a proper consistence. The paper must be perfectly pulped.

2. Make the cement the same, only substituting plaster of Paris for whiting.

Armenian or Jeweler's Cement.—1. Dissolve 5 or 6 bits of gum mastic the size of a large pea in as much spirits of wine as will suffice to render it liquid; in a separate vessel dissolve as much isinglass (previously softened in water, though none of the water must be used) in rum, or other spirit, as will make a two ounce phial of very strong glue, adding 2 small pieces of gum ammoniacum, which must be rubbed or ground till they are dissolved; then mix the whole with a sufficient heat. Keep it in a phial closely stopped, and when it is to be used set the phial in boiling water. The preceding is also effectual in uniting almost all substances, even glass, to polished steel.

2. Thick isinglass glue, 1 part; thick mastic varnish, 1 part. Melt the glue, mix, and keep well corked. Heat in hot water to use.

3. Keller's Armenian Cement.—Soak isinglass, ½ oz., in 4 oz. water, for twenty-four hours; evaporate in a water bath to 2 oz.; add 2 oz. alcohol and strain through linen; mix this while warm with a solution formed by dissolving ¼ oz. best mastic in 2 oz. alcohol; add of powdered gum ammoniac, 1 drm.; and triturated together until perfectly incorporated, avoiding as much as possible the loss of spirit by evaporation.

4. Ure's Formula.—Isinglass, 1 oz.; water, 6 oz.; boil to 3 oz., and add 1½ oz. rectified alcohol; boil for a minute or two, strain, and add while hot, first a milky emulsion of ammoniac, ½ oz., then 5 drm. tincture of mastic.

5. Isinglass soaked in water, and dissolved in spirit, 2 oz. (thick); dissolve in this 10 gr. of very pale gum ammoniac (in tears), by rubbing them together; then add 6 large tears of gum mastic, dissolved in the least possible quantity of alcohol.

6. Isinglass dissolved in proof spirit (as above), 3 oz.; bottoms of mastic varnish (thick, but clear), 1½ oz., mix well.

Ash Cement.—The following is a useful cement to fasten objects of wood to others of metal, glass, stone, etc. Good cabinetmakers' glue is warmed up with water to the consistency necessary to connect wooden objects; then add enough sifted ashes to bring it to the thickness of a varnish. The cement should be applied to the surfaces of the objects to be united when warm, and then they should be pressed together tightly. After cooling and drying, the surfaces are so strongly united as to require great force to separate them. Grinding stones fastened on wood, and handles to painters' stones for grinding colors, have been used for more than a year without exhibiting any appearance of fracture.

Badigeon.—Cement used to cover up unavoidable holes or defects in workmanship. Many formulas. Every trade has its own. Putty, plaster of Paris, sawdust and glue, are extensively used for this purpose.

Barrels and Casks, Cement for Closing.—Tallow, 5 parts; wax, 4 parts; lard, 8 parts; wood ashes sifted, 5 parts. Apply with heat.

Beale's.—Chalk, 60 parts; lime and salt, 20 parts of each; sand, 10 parts (English books of receipts give Barnsey sand); iron filings or dust, 5 parts; blue or red clay, 5 parts. Grind and calcine. Patented as a fireproof cement.

Bell's Cement.—The composition of this cement or varnish is unknown. It may be obtained of J. Bell & Co, 338 Oxford street, London. This cement is largely used by the best microscopists and has obtained a world-wide reputation.

Leather Belting, Cement for.—Take of common glue and American isinglass, equal parts; place them in a boiler, and add water sufficient to just cover the whole. Let it soak ten hours, then bring the whole to a boiling heat, and add pure tannin until the whole becomes ropy or appears like the white of eggs. Apply it warm. Buff the grain off the leather where

it is to be cemented; rub the joint surfaces solidly together, let it dry a few hours, and it is ready for practical use; and if properly put together, it will not need riveting, as the cement is nearly of the same nature as the leather itself.

Belting. See also *Flexible and Rubber Cements.*

Benzine and Petroleum, Cement to Resist.—It has quite recently been discovered that gelatine mixed with glycerine yields a compound liquid when hot, but which solidifies on cooling, and forms a tough, elastic substance, having much the appearance and characteristics of India rubber. The two substances united form a mixture entirely and absolutely insoluble in petroleum or benzine, and the great problem of making casks impervious to these fluids is at once solved by brushing or painting them on the inside with the compound. This is also used for printers' rollers and for buffers of stamps, as benzine or petroleum will clean them when dirty in the most perfect manner and in an incredibly short space of time. Water must not be used with this compound.

Bicycle Tires, etc., Cement for Cuts in.—In 10 oz. carbon bisulphide dissolve 20 oz. caoutchouc; 10 oz. gutta percha; and 5 oz. fish glue. Bind the tire well with cord until set.

Bicycle Tire Cement.—2 parts of pitch and 1 part of gutta percha are melted together. Use hot.

Bismuth Cement.—This cement is used in attaching the tops to kerosene lamps. Lead, 24 parts; tin, 16 parts; bismuth, 20 parts.

Bisque, Cement for.—Burn some oyster shells, reduce to powder in a muller, and pass through a fine sieve; make this into a paste with white of egg. The shells should be thoroughly cleaned, well burned, air slaked, and finely powdered, making simply a fine article of lime. The parts joined must be held firmly together for two minutes or so after the cement has been applied. Be sure the parts are thoroughly clean before joining.

Black Cement.—1 lb. blacksmith's ashes, 1 lb. sharp sand, 2 lb. of resin. Combine as in the last recipe.

Blood Cement.—1. Slaked lime, 50 parts; beaten bullock's blood, 40 parts; alum, 1 part; mix.

2. Slaked lime, 50 parts; fine ashes, 25 parts; bullock's blood, 8 to 10 parts. Used as a pointing for bricks.

Chinese Blood Cement.—This cement is in general use in China for making wooden and pasteboard vessels, willow ware, etc., waterproof. Slaked lime, 50 parts; beaten bullock's blood, 37½ parts; alum, 1 part. Mix together.

Boiler Joints, Cement for.—1. To make a cement for boiler joints, take 10 parts of white lead ground in oil, 3 parts of black oxide of manganese, and 1 part of litharge. Reduce to a proper consistency and apply where needed. See also iron and fireproof cements.

2. Dried clay in powder, 6 lb.; iron filings, 1 lb. Make into a paste with boiled linseed oil. Other receipts given also in steam boiler cements below.

Bone Cement.—1. Take of isinglass, 1 oz.; distilled water, 6 oz; boil to 3 oz., and add rectified spirit, 1½ oz.; boil for a minute or two, strain, and add while hot, first, a milky emulsion of gum ammoniac, ½ ounce, and then tincture of mastic, 5 drm.

2. White Cement for Bone.—If only to fill up cracks, try lime and white of egg made into a paste, or ground rice flour mixed with water.

Botany Bay.—Yellow gum and brick dust equal parts, melted together. Used to cement coarse earthenware, etc.

Böttger's Cement.—Bottger's cement, made with fine precipitated chalk, stirred into solution of sodium silicate at 33° B., to which pigments may be added, if desired, the mixture hardening in six or eight hours.

Bottle Cements.—A number of these cements will be found under **Wax,** *Bottle,* where they are properly placed. See also Massiat's, Chemical, and Glycerine Cements. 1. Copal varnish made thick with red lead or other pigment affords an excellent bottle cement.

2. Bottles, Cement for the Top of.—Mix gelatine and glycerine, apply warm by dipping the neck of the bottle in the mixture. Repeat if necessary.

3. Bottle Cement for Acid Bottles, etc.—Melt over a water bath 2 parts tallow, and gradually add until all is dissolved 30 parts pure rubber. When thoroughly melted add 2 parts of slaked lime.

Brass, to Glass.—1. Knead resin soap with ⅛ the quantity of plaster of Paris.

2. Substitute zinc white for the plaster of Paris, or slaked lime, which causes it to harden much slower.

3. For Cementing Brass Letters to Glass Windows.—16 parts copal varnish; 5 parts drying oil; 3 parts turpentine; 3 parts oil of ditto; 5 parts liquid glue; 10 parts stucco.

Brass Joints, Cement for.—Caoutchouc, 2 parts; gutta percha, 1 part; brass filings, 10 parts. Melt by the aid of heat.

Brewers' Cement.—The following compound is recommended as a good and cheap substitute for brewers' pitch: Coat twice the inside of a barrel with a solution of ½ lb. of resin, 2 oz. of shellac, 2 lb. turpentine, and ½ an oz. of yellow wax, in 1 qt. of strong alcohol. After the complete drying of the second coat, give a last coat by applying a solution of 1 lb. shellac in 1 qt. of strong alcohol. This varnish will perfectly cover up the pores, and does not crack off or impart a foreign taste to the beer.

Brick Dust Cement.—A new cement, for securing iron to stone, is described in some of the foreign papers. The cement is made by melting resin and stirring in brick dust, which must be finely ground and sifted, until a sort of putty is formed, which, however, runs easily while hot. In using, the iron is set into the hole in the stone prepared to receive it, and the melted putty poured in, until the space is filled; then, if desired, bits of brick, previously warmed, may be pushed into the mass, and a little of the cement thereby saved. As soon as the whole is cool, the iron will be firmly held to the stone, and the cement is quite durable and uninjured by the weather, while, unlike lead and sulphur, it has no injurious effect on the iron.

Brimstone. See *Sulphur Cement.*

Brown Cement.—Pure gum rubber, 20 grn.; carbon disulphide, a sufficient quantity; shellac, 2 oz.; alcohol, 3 oz. Dissolve the rubber in the smallest possible amount of the carbon disulphide; add this slowly to alcohol, avoiding clots; add powdered shellac and place the bottle in boiling water until the shellac is dissolved and no more smell of carbon disulphide is given off.

Brunswick Black and Gold Size (Eulenstein, Beale).—Equal parts of Brunswick black and gold size with a very little Canada balsam.

Bruyere's Water.—Prep. Mix 3 gal. of clay with 1 gal. of slaked lime, and expose them to a full red heat for 3 hours.

Buckland's Cement for Labels.—Gum arabic, 2 oz.; starch, 1½ to 2 oz.; sugar, ½ oz. All materials should be pulverized. It can be kept dry and mixed up as used.

Building Stone, Cheap.—Plaster of Paris, 20 parts; 2 parts hydraulic lime; 1 part liquid glue; 100 parts water; pour into moulds when hard; dry in the air for 2 weeks.

Building Cement.—To 1 heaped bushel of mortar, made in the ordinary way, add 3½ qt. (dry measure) of iron scale and 1½ qt. of molasses. Use the same day.

Canada Balsam.—Canada Balsam, to Thin. Can be thinned with turpentine or benzol. Do not use benzole unless the balsam is quite hard. A gentle heat is desirable in order to manipulate properly. See also Lenses, below.

Cap Cements.—These are so named because they are used to fix on parts of electrical or other apparatus to glass. They are very useful for many purposes and should find a place in every laboratory and amateur's workshop. See also Faraday's cement. 1. Glue, best white, 11 oz.; white curd soap, 1 oz.; plaster of Paris, 3¼ lb.; water, ½ gal. The glue is put to soak overnight in just enough of the water to well cover it. In the morning (or when properly softened) it is dissolved together with the soap in the rest of the water previously heated to boiling. When a quantity of the cement is required, a sufficient quantity of the plaster of Paris is mixed up quickly with enough of the warm liquid to form a smooth thin paste. This paste must be used at once, as it soon sets or hardens. When hardened, it is impervious to coal oil. 2. (C. G. Williams.) Equal weights of red lead and white lead used for chemical and electrical purposes. For cementing glass tubes, necks of balloons, etc., into metal mountings. This is preferable to white lead alone, and may be depended on for temperature up to 212°. 3. Resin, 5 lb.; beeswax and dried Venetian red, of each 1 lb, melted together. 4. 7 lb. black resin, 1 lb. red ocher, ½ lb. plaster of Paris, well dried, and added while warm; heat the mass to a little above 212° F. (100° C.) and agitate it together till all frothing ceases and the liquid runs smooth; the vessel is then removed from the fire, and the contents are stirred till sufficiently cool for use. 5. 4 oz. lineseed oil added to the ingredients of the last.

Casein Cements.—1. Casein cements are useful, and if prepared from pure casein are very permanent. The cements of casein with lime are particularly recommended.

2. Casein Cement, for Metals.—Casein is used for a number of cements. Pure casein is prepared in the following way: Skim the milk carefully until there is not a trace of cream. Let it stand in a warm place until it curdles. Then pour it through a paper filter. Wash the casein remaining on the filter with rain water until the water shows no trace of free acid. Tie the casein in a cloth and boil in water to remove all fat. Spread on blotting paper and dry in a moderately warm place. It will shrivel up in a horn-like mass. For the cement for metals mix washed quartz sand, 20 parts; casein, 16 parts; slaked lime 20 parts.

3. Casein, to Prepare.—Pure casein can be prepared as follows: Skim milk of every particle of cream, then stand it in a warm place until it curdles; then filter and wash well with water, tie up in a cloth and boil in water, dry on blotting paper. It can then be kept a long time.

4. A solution of casein in a concentrated aqueous solution of borax, made with cold water, makes a very tenacious cement.

5. Casein and Soluble Glass.—Casein dissolved in soluble silicate of soda or potassium makes a very strong cement for glass or porcelain.

6. A cement to stop cracks in glass vessels, to resist moisture and heat, is made by dissolving casein in a cold saturated solution of borax. With this solution, paste strips of hog's or bullock's bladder, softened in water, on the cracks of glass, and dry at a gentle heat. If the vessel is to be heated, coat the bladder on the outside, just before it has become quite dry, with a paste of a rather concentrated solution of soda and quicklime or plaster of Paris.

7. Cheese Cement for Mending China, etc.—Take skim milk cheese, cut it in slices, and boil it in water. Wash it in cold water and knead it in warm water several times. Place it warm on a levigating stone and knead it with quicklime. It will join marble, stone, or earthenware so that the joining is scarcely to be discovered.

8. Quartz sand, washed, 5 pt.; casein, 4 pt.; soaked lime, 5 pt.; mix. This cement can be used with metals.

9. Casein Cements, Foreign.—The chief cement used in the island of Sumatra is made from the curd of buffalo milk, prepared in the following way: The milk is left to stand till all the butter has collected at the top. The latter is then removed, and the thick sour mass left is termed the curd. This is squeezed into cakes and left to dry, by which it becomes as hard as flint. For use, some is scraped off, mixed with quicklime, and moistened with milk. It holds exceedingly well, even in a hot, damp climate, and, is admirably adapted for mending porcelain vessels.

10. In the German cantons of Switzerland, a compound of cheese and slaked lime is used, under the name of *Kaseleim*, for laying floors, puttying joiners' work, making blocks for hand printing cotton and tapestry goods, and other like purposes. The material sets so rapidly that it is necessary to mix it as the work goes on, which entails trouble and necessitates a certain knack in its use. A Swiss chemist, Brunnschweiler, of St. Gall, has invented a preparation of lime and skim milk, to which he gives the name of *Kaseleim-pulver*, whereby these inconveniences are avoided. Fill a bottle to one-fourth of its height with damp casein; then fill the flask with silicate of soda (water glass), and shake frequently until the casein is dissolved.

Castings. See *Iron Cements.*

To Cement Celluloid on Wood, Leather, etc.—Make a solution of 2 parts shellac in 2 parts spirits of camphor and 6 to 8 parts of alcohol 90%. The best cement is made by dissolving finely scraped celluloid in spirits of wine 90%.

Cement for Celluloid.—Dissolve 2 parts shellac in 2 parts spirits of camphor, and add 7 parts strong alcohol. Apply warm.

Celluloid Cement.—This preparation is practically a trade secret. It can be obtained of the Celluloid Co., New York.

Chatterton's Cement for Gutta Percha.—Resin 2 parts, Stockholm tar 2 parts, gutta percha 4 parts.

Chemical Cement. See also *Laboratory Cement.*—1. A good cement for chemical and electrical apparatus may be prepared by mixing 5 lb. of resin, 1 lb. of wax, 1 lb. of red ocher and 2 oz. of plaster of Paris, and melting the whole with moderate heat.—*American Chemist and Druggist.*

2. Yellow wax 4 parts, common turpentine 2 parts, Venetian red (well dried) 1 part, melted together. Used as a temporary stopping or lute for the ends or joints of tubes which are not exposed to much heat, as in alkalimetry.

3. Mix equal parts of wheat flour, finely powdered Venice glass, pulverized chalk, and a small quantity of brick dust, finely ground; these ingredients, with a little scraped lint, are to be mixed and ground up with the white of eggs. It must then be spread on pieces of fine linen cloth, and applied to the crack of the glasses, and allowed to get thoroughly dry before the glasses are put to the fire.

Chenot's Iron Cement.—Iron reduced from the ores by hydrogen gas is kneaded with gypsum or clay. A little vinegar is sometimes added to facilitate its hardening.

China, Cement for. See *Porcelain, Cement for,* below. The casein cements are very good for mending porcelain.

Chinese Cement (Schio-liao).—1. To 3 parts of fresh beaten blood are added 4 parts of slaked lime and a little alum; a thin, pasty mass is produced, which can be used immediately. Objects which are to be made specially waterproof are painted by the Chinese twice, or at the most three times. Dr. Scherzer saw in Pekin a wooden box which had traveled the tedious road via Siberia to St. Petersburg and back, which was found to be perfectly sound and waterproof. Even baskets made of straw become, by the use of this cement, perfectly serviceable in the transportation of oil.

2. Pasteboard treated therewith receives the appearance and strength of wood. Most of the wooden public buildings of China are painted

with schio-llac, which gives them an unpleasant reddish appearance, but adds to their durability. This cement was tried in the Austrian Department of Agriculture, and by the Vienna Association of Industry, and in both cases the statements of Dr. Scherzer were found to be strictly accurate.

3. Chinese glue is made by covering shellac with strong liquid ammonia and shaking frequently until dissolved. The solution takes some time to form, and is facilitated by standing, placing the bottle (well stoppered) in a moderately warm situation, and briskly agitating it at intervals. Bleached shellac gives a lighter colored cement, but it is not considered as strong. This cement is not particularly recommended.

4. Finest pale orange shellac, broken small, 4 oz.; rectified spirit (the strongest 58 o. p.), 3 oz.; digest together in a corked bottle in a warm place until dissolved; it should have the consistence of molasses. For wood, glass, ivory, jewelery, and all fancy works used.

Chuck Cement, to Remove.—To remove chuck cement from lathe work, warm the object over a spirit lamp and tap lightly with a stiff brush; the wax will adhere to the latter. If in a hurry, a few seconds' boiling in alcohol will remove the remainder of the wax.

Chuck Cement. See *Turner's Cement.*

Clay Cement.—1. Knead 100 parts of dry clay with 10 parts of linseed oil.

2. Clay, 50 parts; glass, powdered, 1 part.

3. Same as above only substituting chalk for the glass and adding an equal amount of boracic acid.

Clock Faces, Cement for White Enameled.—Dammar, 50 parts; gum copal, 50 parts; Venice turpentine, 55 parts; zinc white, 30 parts; ultramarine, 1 to 2 parts. Apply the cement hot, and polish when entirely cold.

Cloth, to Cement. See also *Gutta Percha* and *Pitch Cement.*

Cloth, Cement for.—1. Gutta percha, 16; caoutchouc, 4; pitch, 2; shellac, 1; linseed oil, 2. —*Nomen.*

2. Fastening Cloth on Iron Rolls.—There is nothing better for this purpose than good glue, to which has been added tannin until the glue becomes ropy.

To Cement Cloth to Polished Metal.—Cloth can be cemented to polished iron shafts, by first painting the shafts with a coat of best white lead paint. After the paint has dried hard, coat with Russian glue, dissolved in water acidulated with a little vinegar or acetic acid.

Cement for Cloth or Leather.—16 parts gutta percha, 4 parts India rubber, 2 parts pitch, 1 part shellac, 2 parts linseed oil, all cut small, melted together and well mixed.

Coignet Beton.—5 measures of sand, 1 measure of quicklime, ¼ to ½ measure of hydraulic cement.

Collodion Cement.—Powdered nitrate of potash, 1 dr.; concentrated sulphuric acid, 1½ dr.; carded cotton, 5 gr. The nitrate of potash and the acid should be mixed in a porcelain capsule, gradually add the cotton, and stir for five minutes. Wash it thoroughly in clear water, pull it apart and dry—not near the fire, as it is a species of gun cotton. Dissolve in rectified sulphuric ether and a little alcohol. It will form a transparent, colorless, and strong, adhesive cement.

Concrete Floors.—To make a permanent pavement, excavate to the depth of 2 feet, and lay in the largest stone you can procure, 1 foot deep. Fill in upon this bed enough small stones of egg size to level it very smooth, carefully filling all the interstices between the large stones. Now procure a quantity of coarse gravel, entirely free from loam, and fill in up to within 6 inches of the surface. Let this remain in this condition until it has undergone a thorough settling and packing by being subjected to a heavy rain. You will now have a solid, substantial bed for your concrete, which may be made as follows: To 3 lb. of clear sharp sand add 1 barrel of good cement, dry. Thoroughly incorporate, then sprinkle enough water upon the mixture to make a paste, stirring it well. To this paste add 2 barrels of stone chips and 2 barrels of coarse gravel—but only as much, however, as the paste will take up. Mix thoroughly and deposit it immediately on the bed, letting it fall from the barrow, and leveling it off to its proper height. The whole floor should be covered with as little delay as possible, and when laid should be compressed by a rammer such as is used by street pavers. Finish with a thin coat of pure cement mortar, to bring the surface to complete evenness, and do not let it dry too quickly, but wet it occasionally, so that it may have all the water it will absorb.

Concrete Marble.—Very finely powdered marble or white limestone is mixed with milk of lime until a smooth paste is formed. Some powdered limestone may now be added and the mixture used at once.

Concrete.—1. Five parts coarse sand, 12 parts pebbles, 3 parts lime.

2. 16 parts pebbles, 8 parts river sand, 2 parts lime.

Coppersmiths' Cement.—Powdered quicklime mixed with bullock's blood; use at once.

Coppersmiths' Cement for Fastening Copper to Sandstone.—Take 3½ parts white lead, 3 parts litharge, 3 parts bole, and 2 parts broken glass, and rub up with 2 parts linseed oil varnish.

Corks, etc., Cement for.—1. Zinc white rubbed up with copal varnish to fill up the indentures; when dry, to be covered with the same mass, somewhat thinner; and lastly, with copal varnish alone. Plain shellac varnish will often answer the purpose.

2. Corks boiled in paraffin resist the action of the atmosphere, also worms and insects.

To Mend Crockery Ware.—One of the strongest cements, and easiest applied for this purpose, is lime and the white of an egg. To use it, take a sufficient quantity of the egg to mend one article at a time, shave off a quantity of lime, and mix thoroughly. Apply quickly to the edges and place firmly together, when it will very soon become set and strong. Mix but a small quantity at once, as it hardens very soon, so that it cannot be used. Calcined plaster of Paris would answer the same purpose as lime.

Crocus Cement.—Crocus, mixed with a little linseed oil, makes a hard and useful cement.

Crucible.—1. A mixture of powdered clay and brickdust, made up with water, or a solution of borax. Used to join crucibles which are exposed to a strong heat. When mixed up with borax solution the lute becomes a compact vitreous mass in the fire.

2. Form a paste with water of 2 parts borax, 2 parts slaked lime, and 1 part of litharge. Can also be used for porcelain.

See also *Lutes.*

Cutlers' Cement for fastening blades of dinner knives in ivory handles consists of resin, 4 parts; beeswax, 1 part; plaster of Paris or brick dust, 1 part. Fill the hole in the handle with the cement, heat the tang of the blade, crowd in and remove superfluous cement.

2. 16 oz. rosin, 16 oz. hot whiting, 1 oz. wax.

3. 5 parts pitch, 1 part wood ashes, 1 part hard tallow, melted together.

4. 4 lb. black rosin melted with 1 lb. beeswax, and 1 lb. red hot whiting added.

Dammar Cement.—Dissolve gum dammar in benzole, add ½ of gold size. This has the advantage of drying very quickly, and may be preferably used for a first coat when glycerine is used as the material for mounting.

Davy's Cement.—Davy's universal cement is made by melting 4 parts of common pitch with 4 parts of gutta percha in an iron vessel, and mixing well. It must be kept fluid, under water, or in a dry, hard state.

Diamantkitt.—A German cement, according to Hager. Graphite, 50 parts; litharge, 15 parts;

milk of lime, 10 parts; slaked lime, 5 parts; intimately mixed with enough linseed oil to make a firm mass.

Diamond Cement. See *Armenian Cement.*

Earthenware, Glass, etc., Cement for.—Isinglass, 1 part steeped in 4 parts of water, and dissolved in 4 parts glacial acetic acid.

Egg Cements.—These are useful household cements. 1. Use white of an egg beaten up with an equal quantity of water, add enough slaked lime to make a paste; apply immediately

2. Plaster of Paris, with the addition of ¼ its weight of lime, and a q. s. of white of egg. Reduce the lime, which should be freshly slaked, to a fine powder. Mix quickly, apply immediately, and allow it to remain undisturbed for at least three days.

Elastic Cement. See also *Rubber Cements*—1. An elastic cement is made by mixing together, and allowing to dissolve, the following: 4 oz. of bisulphide of carbon, 1 oz. of fine India rubber, 2 drm. of isinglass, ½ oz. of gutta percha. This cement is used for cementing leather and rubber, and when to be used the leather is roughened and a thin coat of the cement is applied. It is allowed to completely dry, then the two surfaces to be joined are warmed and then placed together and allowed to dry.

2. (Lenher.) Caoutchouc, 5 parts; chloroform, 3 parts; dissolve, and add gum mastic (powdered), 1 part. Elastic and transparent.

3. Gutta percha, 4 oz.; pure rubber, 1 oz.; pitch, 1 oz.; shellac, ¼ oz.; linseed oil, ½ oz.; melt. Apply with heat.

Emery, Cement to Fasten to Wood.—A cement for fastening emery to wood may be prepared as follows: Melt together equal parts of shellac, white resin, and carbolic acid in crystals; add the last after the others are melted. The effect of the carbolic acid is surprising.

English Roman Cement.—Take a bushel of lime slaked with 3½ lb. of green copperas, 15 gal. of water, and ½ a bushel of fine gravel sand. The copperas should be dissolved in hot water; it must be stirred with a stick, and kept stirring continually while in use. Care should be taken to mix at once as much as may be requisite for one entire front, as it is very difficult to match the color again; and it ought to be mixed the same day it is used.

Entomologists' Cement.—1. Isinglass and thick mastic varnish, equal parts.

2. Dissolve gum ammoniac in alcohol, add the best isinglass with gentle heat. It melts at a gentle heat.

Evans' Cement.—26 parts of cadmium and 74 parts of mercury; dissolve this amalgam in an excess of mercury, knead thoroughly, and heat if necessary, so that the cement is plastic as wax.

Extemporaneous.—1. Shellac melted and run into small sticks the size of a quill. Used to join glass, earthenware, etc. The edges are heated sufficiently hot to melt the cement, which is then thinly smeared over them, and the joint made while they are still hot.

2. Tears of gum mastic, used in the same way. Commonly employed by jewelers.

Faraday's Cap Cement.—Electrical cement. Resin, 5 oz.; beeswax, 1 oz.; red ocher or Venetian red in powder, 1 oz. Dry the earth thoroughly on a stove at a temperature above 212°. Melt the wax and resin together and stir in the powder by degrees. Stir until cold, lest the earthy matter settle to the bottom. Used for fastening brass work to glass tubes, flasks, etc.

Fat Cements.—1. Clay is dried, powdered, sifted, placed in an iron mortar, and incorporated with drying oil, added gradually, the whole being well beaten up till the mass assumes the consistence of a fine paste. It should be preserved under a coating of oil, to prevent it drying up. It resists the action of corrosive gases, but inconveniently softens by exposure to heat. 2. Plaster of Paris, mixed with water, milk, or weak glue. Stands a dull-red heat.

Fire Proof. See also *Iron Cements.*—1. Iron filings, 140 parts; hydraulic lime, 20; quartz sand, 25; sal ammoniac, 3. These are formed into a paste with vinegar, and then applied. The cement is left to dry slowly before heating. 2. Iron filings, 180 parts; lime, 45; common salt, 8. These are worked into a paste with strong vinegar. The cement must be perfectly dry before being heated. By heating it becomes stone hard. 3. Linseed or almond meal, mixed to a paste with milk, lime water or starch paste; resists a temperature of 500° F. (260° C.) 4. Clay is puddled with water, and to it is added the greatest possible quantity of sand, which has been passed through a hair sieve; the whole is worked up in the hands, and applied in coats more or less thick on vessels needing protection from the direct action of the fire. 5. 1 part of sifted manganese peroxide, 1 pulverized zinc white, sufficient commercial soluble glass to form a thin paste. To be used immediately. Becomes very hard, and presents a complete resistance to red heat and boiling water. 6. As a coating for glass vessels, to protect them from injury during exposure to fire, pipe clay and horse dung are made into a paste with water. This composition is applied by spreading it on paper; it is used by pipe makers and will stand the extreme heat of their furnaces for 24 hours without damage. 7. Shredded tow or plumbago is substituted for the horse dung. 8. Clay, 5 parts; iron filings, 1 part; and linseed oil varnish q. s. to mix. 9. 10 parts common clay dried and pulverized; 4 parts iron filings; 1 part common salt; 1 part borax; 2 parts manganese peroxide.

Flexible Cement.—Flexible cement is composed of white pitch and gutta percha equal parts, mixed over a water bath. Many of the other gutta percha and rubber cements answer for flexible cements.

Floor Cement.—1. For cellar bottoms use 5 parts of clean, coarse, sharp sand (plasterers call it fine gravel) to 1 part of cement. It only requires to be damp enough to work well. It is mixed in a box, wheeled into the cellar, dumped and spread smooth with a shovel, hoe, or trowel, about 2 in. thick. Take a spade or shovel, flat side, and beat it down hard and smooth. For finishing, use 1 part of cement to 1 part of sand; this is thoroughly mixed, and then watered so it is like plastering mortar. Dump it on the first coat, about ½ in. thick; spread and smooth with a trowel. It will soon become as hard as stone. The cement is known as Portland cement, though the common hydraulic cement will answer if fresh.

2. Mix 6 parts of plaster of Paris with 1 part of lime; wet, slake and lay the floor. Then go over it after it is dry with a solution of copperas. This is repeated several times. The surface must be perfectly dry before each application. Finally, after some days' drying, brown with boiled linseed oil and finally varnish with copal varnish. The floor may have to be laid in sections, on account of the expansion on setting. The iron oxide turns brown on exposure to the air.

Concrete for Foundations.—5 parts gravel and sand to 1 part fresh-burned stone lime, ground to powder, without slaking, and measured dry. Well turn and shovel together, with sufficient water to slake the lime into the state of very thick mortar. Chips and small pieces of stone may be added with advantage.

Concrete for Masonry.—1. Screened sand, 9 parts by measure; slaked lime, 7 parts; forge ashes, 1 part; puzzuolana, 1 part.

2. 1 part slaked lime, 1 part sea sand, ¼ part furnace ashes.

Concrete for Brickwork.—Slaked lime, 7 parts by measure; sand, 12 parts.

French Cement.—Gum water thickened with starch; a little lemon juice is sometimes added.

Fruit Can.—Cement for sealing fruit cans is made of resin 1 lb., tallow 1 oz. See wax.

Filling Cement for Holes in Wood.—Mix together resin and turpentine 1 pt. each over a water bath and add 2 pt. common burnt ocher. Have the work dry.

Cement for Patent Fuel.—This cement, used for the agglomeration of coal dust and the manufacture of patent fuel, consists of coal tar, gluten and starch. The quantities of these substances vary according to the quality and property of coal dust. About 2% of this mixture (say containing 2½ parts tar, 1 part gluten, ½ part starch) would be suitable for coal dust of an average quality of bituminous coal.

Gas Bags, Cement for.—Add part of glycerine to very thick boiled glue. Fill the bag with air and apply while warm; if too sticky strew it with a little powdered soapstone. For large rents use leather well covered with glue.

Gas Fitters' Cement.—Melt together 4½ parts resin (by weight), 1 part beeswax, then stir in 3 parts Venetian red and pour into moulds made of oiled paper or iron.

Gas Retorts, Cement for.—For cementing earthenware gas retorts, which have to withstand very high temperatures, the following cement can be used: Powdered glass, 5 parts; chamotte meal, 5 parts; powdered borax, 1 part. Chamotte meal is obtained by pulverizing broken pieces of gas retorts. This cement is a hard glass, which only melts at the highest temperatures, then closes the leaks in the retort. To render the iron retort cover which closes the retort air tight, a cement is used consisting of schwerspath powder, to which as much soluble glass has been mixed as to obtain a paste of sufficient strength.

Gelatine Cement.—(Marsh's Section Cutting, 2d ed., p. 104.) Take ½ oz. of Nelson's opaque gelatine, soak well in water, melt in the usual way, stir in 3 drops of creosote, and put away in a small bottle. Use warm. (For microscopists' use.)

German Cement.—An excellent cement for glass or earthenware is made as follows: 2 parts gum shellac and 1 part Venice turpentine; fuse together in an iron pot, and when partially cool form into sticks. When wanted for use, melt near a gentle heat. Care must be taken while fusing the material to keep the vessel closed, as the turpentine is very inflammable; or, 2 parts litharge and 1 part each of unslaked lime and flint glass; pulverize separately and mix. To use it, wet with old drying oil.

Glass Cement.—1. Lead, 3 parts; tin, 2 parts; bismuth, 2½ parts.

2. A good cement for glass, and one which completely resists the solvent action of water, may, according to Herr H. Schwartz, be prepared by the following process: From 5 to 10 parts of pure, dry gelatine are dissolved in 100 parts of water. To the solution about 10% of a concentrated solution of bichromate of potash is added, and the liquid is kept in the dark. When articles joined by this cement are exposed to the light, the gelatine film is acted upon by the chemical rays, the chromate being partially reduced, and the film of cement becomes tough and durable.

3. Two parts of isinglass are soaked in water until well swollen; the water is then poured off, and the isinglass is dissolved in alcohol by the aid of heat. One part of mastic is then dissolved in three parts alcohol and added to the above solution; then one part of gum ammoniacum. The solution is well shaken, and evaporated to the consistency of strong glue, when it solidifies on cooling. For use, the cement and the articles themselves must be warmed.

4. 5 parts pumice stone are mixed with 1 of turpentine and 2 of shellac.

5. *Cement for Glass and Porcelain, in Sticks.*—A good cement for glass and porcelain can be made as follows: Melt together sulphur, 6 parts; white Burgundy pitch, 4 parts; shellac, 1 part; elemi, 2 parts; mastic, 2 parts; powdered kaolin, passed through a very fine sieve, 6 parts. Before applying, the surfaces to be joined must be carefully heated.

6. Lead, 3 parts; tin, 2 parts; bismuth, 2·5 parts.

7. Best and purest gum arabic is put into a small quantity of water, and left till next day, when it is of the consistence of treacle. Calomel (mercurous chloride or subchloride of mercury, poison) is then added to make a sticky mass, and well mixed on a glass plate with a spatula. No more is to be made than that required for immediate use. The cement hardens in a few hours, but it is better to leave it for a day or two.

8. Transparent for Glass.—Dissolve 1 part of India rubber in 64 parts of chloroform; then add gum mastic in powder, 14 to 24 parts, and digest for two days with frequent shaking. Apply with a camel's hair brush.

9. The *Pharmacist* recommends the following as a proved recipe: "Take 1 oz. of Russian isinglass, cut it in small pieces, and bruise well, in order to separate the fibers; then add 6 oz. of warm water, and leave it in a warm place that the isinglass may dissolve, which will require from 34 to 48 hours. Evaporate this to about 3 oz. Next dissolve ½ oz. mastic in 4 oz. of alcohol, and when this is ready, transfer the isinglass from the evaporating dish to a tin can (an empty ether can will be found convenient), heat both solutions, and add the mastic solution to the isinglass in small quantities at a time, shaking the can violently after each addition. While still hot strain the liquid through muslin cloth and put up in ½ oz. bottles. This cement is very valuable, and articles, such as mortars, graduates, etc., mended by it, have been in use for years, and, in fact, seem to be stronger than they were originally."

10. Pure casein (see *Casein*) is dissolved in sodium silicate (water glass) in the proportion of 1 part of casein to 6 or 7 of the silicate. Apply at once and dry in the air.

11. Use bleached shellac and turpentine, varying proportions.

12. Elemi, 1 part; shellac, 4 parts; turpentine, 2 parts. Melt.

13. Use Canada balsam, which can be obtained at any artist's colorman. This is used by opticians to cement their lenses together, and is perfectly transparent.

14. Glass, Lime, Oil, Cement for.—Quicklime, 4 parts; litharge, 6 parts; linseed oil varnish, 1 part.

15. Glass, Oil, Cement for.—Burned lime, 10 parts; litharge, 15 parts; pipe clay, 5 parts; linseed oil varnish, 3 parts.

16. Without Heat.—Boil isinglass in water, to a creamy consistence, and add a little alcohol. Warm before using.

17. Melt 5 or 6 bits of gum mastic, as large as peas, in the smallest quantity of alcohol; mix with 2 oz. of a solution of isinglass (made by dissolving isinglass in boiling brandy to saturation), having previously mixed the isinglass solution with 2 or 3 bits of galbanum, or gum ammoniac; keep in a well corked bottle, and gently heat before using.

18. With a small camel brush, rub the edges with a little carriage oil varnish, and, if neatly put together, the fracture will hardly be perceptible, and, when thoroughly dry, will stand both fire and water.

19. Dissolve fine glue in strong acetic acid to form a thin paste.

20. Canada balsam, or clear glue (gelatine), to which has been added a small quantity of bichromate of potash. The latter soon loses its yellow tint, and becomes unaffected by damp when exposed to daylight.

21. 2 parts of common black pitch and 1 part gutta percha, melted and worked together till mixed; or 2 parts shellac, 1 part Venice turpentine, melted together. These would want

using warm. They are both impervious to weather influences.

Glass to Brass.—Boil 3 parts of resin with 1 part of caustic soda and 5 parts of water, thus making a kind of soap, which is mixed with ½ its weight of plaster of Paris.

Glass to Iron.—Soak fine white glue or gelatine in water overnight. Pour off the surplus water and add molasses equal to about 25% of the bulk of glue. Heat gently and stir until the mixture is formed. The proportion of molasses can be varied to suit. Glycerine may be used instead of molasses.

Glass to Metal.—1. One of the best cements for uniting glass to other substances consists of a mixture of gum and calomel. Its adhesive power is something marvelous. It is prepared by putting the very best and purest gum arabic into a small quantity of water, and leaving it till next day, when it should be of the consistence of treacle. Calomel (mercurous chloride or subchloride of mercury), is then added in suitable quantity, enough to make a sticky mass, being well mixed on a glass plate with a spatula. No more is to be made than that required for immediate use. The cement hardens in a few hours, but it is wiser to leave it to itself for a day or two. To insure success it is necessary to use only the very best gum: inferior sorts are absolutely useless.

2. A cement for such purposes as fixing metal letters to glass windows consists of copal varnish 15 parts, drying oil 5 parts, turpentine 3 parts, oil of turpentine 2 parts, liquefied marine glue 5 parts. Melt in a water bath, and add 10 parts dry slaked lime.

3. Brass letters may be securely fastened on glass windows by the following cement: Litharge, 2 parts; white lead, 1 part; boiled linseed oil, 3 parts; gum copal, 1 part. Mixed just before using, this forms a quick drying and secure cement.

4. 1 lb. of shellac, dissolved in 1 pt. of strong methylated spirit, to which is to be added ⅛ part of a solution of India rubber in carbon bisulphide.

5. Take 2 oz. of a thick solution of glue, and mix with 1 oz. of linseed oil varnish, or ¾ oz. of Venice turpentine. Boil together, agitating until the mixture becomes as intimate as possible. The pieces cemented should be clamped together for a space of forty-eight to sixty hours.

6. 60 parts starch, 100 parts finely pulverized chalk, are made into a mixture with equal parts of water and spirit, and the addition of 30 parts Venice turpentine, taking care to agitate the mass with a stick, so as to insure its homogeneity.

7. 4 parts glue melted with the least possible quantity of water, 1 part Venice turpentine; will resist moisture.

8. Rough the edges of the glass, and cement with a creamy paste of plaster of Paris and alum water. Make a saturated solution of alum, and then add the plaster until you have a thick creamy mass. Put this into glass, and then insert glass; true, and let it remain until quite hard.—*W. J. Lancaster.*

9. Litharge, 2 pt.; white lead, 1 pt.; work into a pasty condition by using 3 pt. boiled linseed oil, 1 pt. copal varnish.

Glass Letters, to Fix.—A thick solution of marine glue in wood naphtha is a good cement for fixing glass letters. The glass must be chemically clean and must be previously scrubbed with soda, then with whitening and water, followed by thorough rubbing.

Glass Cement.—1. Take pulverized glass, 10 parts; powdered fluorspar, 20 parts; soluble silicate of soda, 60 parts. Both glass and fluorspar must be in the finest possible condition, which is best done by shaking each in fine powder, with water, allowing the coarser particles to deposit, and then to pour off the remainder, which holds the finest particles in suspension. The mixture must be made very rapidly, by quick stirring, and when thoroughly mixed must be at once applied. This is said to yield an excellent cement.

2. Red lead and boracic acid, equal parts, add ⅔ part fine white sand; mix, reduce to very fine powder, make into a paste with dilute sodium silicate. Apply as an ordinary cement, and heat high enough to fuse the water glass.

Glassware, Cement for.—1. Delicate glassware, as Venetian glass, can be cemented with best fish glue applied hot and afterward tied well

2. 10 parts of gelatine are mixed with 2 parts of acid chromate of lime in solution. This cement is hardened by the action of light.

Glass, Water, Cements. See *Soluble Glass.*

Glue.—Glue is a very valuable ingredient in many cements. Starch and isinglass are also valuable, serving to decrease the brittleness of many cements, but unfortunately they are not waterproof.

The subject of *Glue* has been fully treated in another portion of this work. See **Glues.**

Glue Cement.—1. Common glue with pulverized chalk added makes an excellent cement for wood and metals.

2. *Glue Cement to Resist Moisture.*—1 part glue, 1 part black resin, ¼ part of red ocher; mix with the least possible quantity of water; or, 4 parts glue, 1 part of boiled oil by weight, and 1 part oxide of iron.

3. Glue, 1 lb., melted with the least possible quantity of water, and then mixed with black resin, 1 lb., and red ocher, 4 oz.

4. Glue, melted as above, and mixed with about ¼ of its weight each of boiled oil and red ocher.

5. Ure.—Melted glue (of the consistence used by carpenters), 8 parts; linseed oil, boiled to varnish, with litharge, 4 parts; incorporate thoroughly together.

6. Glue (melted as last), 4 parts; Venice turpentine, 1 part.

The first three dry in about forty-eight hours, and are very useful to render the joints of wooden casks, cisterns, etc., water tight; also to fix stones in frames. The last serves to cement glass, wood, and even metal to each other. A good cement for fixing wood to glass may be made by dissolving isinglass in acetic acid, in such quantities that it becomes solid when cold. When applied let it be heated. They all resist moisture well.

• *Gram-Rutzon's Cement.*—Hard Canada balsam, 50 grm.; shellac, 50 grm; absolute alcohol, 50 grm.; anhydrous ether, 100 grm. The ingredients are mixed, and when the gums are dissolved, filter if necessary, and evaporate away from the flame, over a water bath until of sirupy thickness.

Grinder's Cement.—1. Pitch, 5 parts; wood ashes and hard tallow, of each 1 part, melted together.

2. Black resin, 4 lb.; beeswax, 1 lb.; melt and add of whiting, previously heated red hot and still warm, 1 lb.

3. Shellac melted and applied to the pieces slightly heated. Used to fix pieces of glass while grinding. The last is used for lenses and fine work.

Gronvelle's Oil Cement.—White lead, 1¼ parts; red lead, ½ part; dry clay, 1 part. Mix with boiled linseed oill.

Gutta Percha and Rubber Cements.—Are valuable for many purposes, especially where the article is not required to be fireproof.

Gutta Percha Cements. See caution under rubber cements.

Gutta Percha Cement.—1. This highly recommended cement is made by melting together in an iron pan 2 parts common pitch and 1 part gutta percha, stirring them well together until thoroughly incorporated, and then pouring the liquid into cold water. When cold it is black, solid and elastic; but it softens with heat, and at 100° Fahr. is a thin fluid. It may be used as

a soft paste, or in the liquid state, and answers an excellent purpose in cementing metal, glass, porcelain, ivory, etc. It may be used instead of putty for glazing windows.

2. Fuse together equal parts of gutta percha and pitch. Use hot.

3. A very adhesive cement, especially adapted for leather driving belts, is made by taking bisulphide of carbon 10 parts, oil of turpentine 1 part, and dissolving in this sufficient gutta percha to form a paste. The manner of using this cement is to remove any grease that may be present in the leather by placing on the leather a piece of rag and rubbing it over with a hot iron. The rag thus absorbs the grease, and the two pieces are then roughened and the cement lightly spread on. The two pieces are then joined, and subjected till dry to a slight pressure.

4. A solution of gutta percha for shoemakers is made by taking pieces of waste gutta percha, first prepared by soaking in boiling water till soft. It is then cut into small pieces and placed in a vessel and covered with coal tar oil. It is then tightly corked to prevent evaporation, and allowed to stand for twenty-four hours. It is then melted by standing in hot water till perfectly fluid, and well stirred. Before using it must be warmed as before, by standing in hot water.

5. An elastic gutta percha cement especially useful for attaching the soles of boots and shoes, as on account of its great elasticity it is not liable to break or crack when bent. To make it adhere tightly the surface of the leather is slightly roughened. It is prepared as follows: By dissolving 10 parts of gutta percha in 100 parts of benzine. The clear solution from this is then poured into another bottle containing 100 parts of linseed oil varnish, and well shaken together.

6. Fuse together equal parts of pitch and gutta percha, and to this add about 2 parts of linseed oil containing 5 parts of litharge. Continue the heat until the ingredients are uniformly commingled. Apply warm.

7. A gutta percha cement for leather is obtained by mixing the following. It is used hot. Gutta percha, 100 parts; black pitch or asphaltum, 100 parts; oil of turpentine, 15 parts.

8. Gutta Percha Cement (Harting), used by Microscopists.—Gutta percha cut in pieces, 1 part; turpentine, 15 parts; shellac, 1 part. Heat the gutta percha and turpentine together, filter, add the shellac (pulverized), and beat until a drop hardens on a cold glass plate. Used to attach cells; the slide must be warm when using the cement.

9. Gutta Percha to Leather. Gutta percha, 100 parts; Venice turpentine, 80 parts; shellac, 8 parts; pure unvulcanized rubber, 2 parts; liquid storax, 10 parts. Heat the turpentine, then add the gutta percha and shellac. Heat over a water bath.

Cement for Gutta Percha.—Stockholm tar, 1 part; resin, 1 part; gutta percha, 3 parts.

Hagar's Cement.— Graphite (elutriated), 500 parts; whiting, 150 parts; litharge, 150 parts. Mix with linseed oil varnish to form a stiff putty.

Hamelin's Mastic.—Siliceous sand, 60 parts; Bath or Portland stone (in fine powder) 40 parts; lime marl, 20 parts; litharge, 8 parts; ground together. For use, it is mixed up with linseed oil and used like mortar. When this cement is applied to the purpose of covering buildings, intended to resemble stone, the surface of the building is first washed with linseed oil.

Heat and Acid Proof Cement.—Sulphur, 100 parts; tallow, 2 parts; resin, 2 parts. Melt these together to a ruddy sirup, add sifted ground glass to form a paste, and heat when used.

Hessler's Cement.—Litharge, 6 parts; quicklime, 4 parts; white bole, 2 parts. Grind with boiled linseed oil. Though tenacious, it is not recommended, on account of time required to set.

Hoenle's Cement.—This is composed of shellac and Venice turpentine. Shellac, 2 parts; turpentine, 1 part. Melt and mould into stieks.

Hoofs of Horses, Cement for. — Use gutta percha, 2 parts; gum ammoniac, 1 part. Heat the gutta percha and gradually add the gum ammoniac, which must be very finely powdered. Heat for use.

Horn and Bone, Cement for.—Dissolve in 6 parts linseed oil, 5 parts of mastic and 2 parts of turpentine.

Household Cement. — Alum and plaster of Paris, well mixed in water and used in the liquid state, form a hard composition and also a useful cement

Hydraulic Cement.—1. Burnt brick, 63 parts; litharge, 7 parts. Use with linseed oil. Wet the surfaces to be cemented.

2. Gad's.—Clay, well dried and powdered, 3 parts; oxide of iron, 1 part; mixed together, and made into a stiff paste with boiled oil. Used for work required to harden under water.

3. Turkish Plaster or Hydraulic Cement.—Fresh lime, 150 lb. (reduce to powder); linseed oil, 15 qt.; cotton, 1½ to 3 oz. Gradually mix the oil and cotton into the lime until the mixture is of the consistency of bread dough. Mix in a wooden vessel. Dry the mixture, and when used form a paste by mixing with linseed oil. Put on in coats. Used to coat water pipes of clay or metal.

Impervious Cement.—Use zinc white, rubbed up with copal varnish. See also *Waterproof Cements.*

Cement Impervious to Bisulphide of Carbon.—Best quality of white glue with 10% of molasses added.

Cement for Incandescent Lamp Filaments.—Take 100 grn. carburet of iron (Dixon's stove polish), grind dry to a fine powder, add 10 grn. lump sugar, mix well in a mortar; then add 40 grn. gold bronze, mix again; then add sufficient water to make a thick paste, and apply it to the junction between the carbon and the platinum wire; allow it to stand for twenty minutes or so, then burn the joint to a cherry red heat by a fine gas flame.

India Rubber Cements and Cement for. See *Rubber.*

Indianite Cement.—1. 100 parts finely chopped rubber, 15 resin, 10 shellac, dissolved in a sufficient quantity of bisulphide of carbon. Used for uniting pieces of India rubber.

2. India rubber, 15 grn.; chloroform, 2 oz.; mastic, ½ oz. The two first named to be mixed, and after the rubber is dissolved add the mastic in powder; allow to macerate for a week. Do not bring near an open light.

An Insoluble Cement.—A very valuable cement has been discovered by Mr. A. C. Fox, of which details are published in *Dingler's Polytechnisches Journal.* It consists of a chromium preparation and isinglass, and forms a solid cement, which is not only insoluble in hot and cold water, but even in steam, while neither acids nor alkalies have any action upon it. The chromium preparation and the isinglass or gelatine do not come into contact until the cement is desired, and when applied to adhesive envelopes, for which the author holds it to be especially adapted, the one material is put on the envelope covered by the flap (and, therefore, not touched by the tongue), while the isinglass, dissolved in acetic acid, is applied under the flap. The chromium preparation is made by dissolving crystallized chromic acid in water. Take: Crystallized chromic acid, 2·5 grm.; water, 15 grm.; ammonia, 15 grm. To this solution add 10 drops of sulphuric acid and 30 grm. of sulphate of ammonia and 4 grm. of fine white paper. In the case of envelopes, this is applied to that portion lying under the flap, while a solution prepared by dissolving isinglass in

dilute acetic acid (1 part acid to 7 parts water) is applied to the flap of the envelope. The latter is moistened, and then is pressed down upon the chromic preparation, when the two unite, forming a firm and insoluble cement.

Insulating Cement.—1. Shellac, 5 parts; resin, 2 parts; Venice turpentine, 1 part; yellow ocher, 3 parts.

2. Common sealing wax and jeweler's cement are very convenient for many uses. The cement sold for attaching bicycle tires to the wheels is useful for making tanks, cementing rubber, etc.

Insulators, Cement for.—Sulphur, lead, plaster of Paris, with a little glue to prevent it setting quickly.

Cement for Insulating Tapes.—1. Pure gum rubber dissolved in turpentine, with the addition of 5% of raw linseed oil.

2. Yellow pitch, 8 parts; beeswax, 2 parts; tallow, 1 part.

Iron Articles in Stone, Cement for Fastening—Plaster of Paris, 14 parts; iron filings, 2 parts. Mix and stir into a paste with water. This cement dries quickly.

Iron Cements.—A large number of the so-called iron cements are given below. These have been selected from a large number, and have been chosen with special regard to their apparent trustworthiness. See also *Rust, Stone,* and *Brick Dust Cements.*

Iron Cement for Closing the Joints of Iron Pipes.—1. Take of coarsely powdered iron borings, 5 lb.; powdered sal ammoniac, 2 oz.; sulphur, 1 oz.; and water sufficient to moisten it. This composition hardens rapidly; but if time can be allowed it sets more firmly without the sulphur. It must be used as soon as mixed and rammed tightly into the joint.

2. Take sal ammoniac, 2 oz.; sublimed sulphur, 1 oz.; cast iron filings or fine turnings, 1 lb. Mix in a mortar and keep the powder dry. When it is to be used, mix it with twenty times its weight of clean iron turnings, or filings, and grind the whole in a mortar; then wet it with water until it becomes of convenient consistence, when it is to be applied to the joint. After a time it becomes as hard and strong as any part of the metal.

3. For stopping holes in castings or covering scars a useful cement may, it is said, be made of equal parts of gum arabic, plaster of Paris, and iron filings, and if a little finely pulverized white glass be added to the mixture it will make it still harder. This mixture forms a very hard cement that will resist the action of fire and water. It should be kept in its dry state and mixed with a little water when wanted for use.

4. Iron Cement which is Unaffected by Red Heat.— 4 parts iron filings, 2 parts clay, 1 part fragment of a Hessian crucible; reduce to the size of rape seed and mix together, working the whole into a stiff paste with a saturated solution of salt. A piece of fire brick can be used instead of the Hessian crucible.

5. A correspondent of the *English Mechanic* says that he used the following recipe with the greatest success for the cementing of iron railing tops, iron gratings to stoves, etc., and with such effect as to resist the blows of a sledge hammer: Take equal parts of sulphur and white lead, with about ¼ of borax; incorporate the three so as to form one homogeneous mass. When going to apply it, wet it with strong sulphuric acid and place a thin layer of it between the two pieces of iron, which should then be pressed together. In five days it will be perfectly dry, all traces of the cement having vanished, and the iron will have the appearance of having been welded together.

6. The following cement is recommended for repairing damaged places in cast iron tanks, cisterns, etc.: 5 parts brimstone, 2 parts black lead, and 2 parts cast iron filings (previously sifted) are melted together, taking care that the brimstone does not catch fire. The damaged place, perfectly dry, is well heated by laying a piece of red hot iron upon it, and is then stopped with the cement, previously heated in a melting ladle till it becomes soft.—*Metall-Arbeiter.*

7. Equal parts sifted zinc white and manganese peroxide are mixed with soluble glass, q. s., to form a thin paste; use at once.

8. Cast iron borings 10 lb., red lead 1 lb., alum ½ lb., lime 5 lb., sal ammoniac 2 oz. Dissolve the alum and sal ammoniac in a small quantity of hot water, and mix in the other ingredients.

9. Equal parts of sulphur and white lead with about one-sixth proportion of borax are the constituents of the mixture, and the three should be thoroughly incorporated together so as to form one homogeneous mass. When the composition is to be applied it should be wetted with strong sulphuric acid, and a thin layer of it should be placed between the two pieces of iron to be connected, these being at once pressed together. This cement will hold so firmly as to resist the blows of a steam hammer, and dry so completely in a few days as to leave no trace of the cement, the work then presenting the appearance of welding.

10. For Hot Air Pipes.—60 parts (by measure) of chalk, 20 parts of limestone or lime, 20 parts of salt, 10 parts of brawsey sand, 5 parts of iron filings, and 5 parts of red or blue clay, properly mixed together, triturated and calcined.

11. For Hot Water Cistern.—To 4 or 5 parts clay, dried and pulverized, add 2 parts of fine iron filings free from oxide, 1 part of peroxide of manganese, ½ part of sea salt and ½ part of borax. Thoroughly incorporate these in as fine a state as possible, reduce them to a thick paste with water, and use immediately. It should then be exposed to a heat, gradually increasing to almost a white heat. This cement resists heat and boiling water.

12. Glycerine and litharge, stirred to a paste, harden rapidly, and make a tolerable cement for iron upon iron, for two stone surfaces, and especially for fastening iron in stone. This cement is insoluble, and is not acted upon by strong acids.

13. You can cement cloth to polished iron shafts by first giving them a coat of best white lead paint; this being dried hard, coat with best Russian glue, dissolved in water containing a little vinegar or acetic acid.

14. For Iron and Glass.-Copal varnish 15 parts, drying oil 5 parts, turpentine 3 parts, oil of turpentine 2 parts, liquefied glue 5 parts; to be all melted in a water bath, and add 10 parts of slaked lime.

15. For Cast Iron Cisterns of Large Dimensions.—Composed of sal ammoniac, clean borings and urine, mixed one day before required. The proportions are 1 lb. sal ammoniac to 100 lb. borings, with sufficient urine to make a stiff paste—to be well driven into the joints with a calking tool a little narrower than the space between the flanges. Give at least three days to set before filling cistern with water. The cement sets as hard as the metal itself.

16. Iron borings 12 lb., sal ammoniac 2 oz., sulphur 1 oz., water q. s.

17. Iron borings 7 to 8 lb., sal ammoniac 2 oz., water as before. The strongest lute, perhaps, is (17); but when the work is required to dry rapidly, as in the case of steam joints wanted in a hurry, the quantity of sal ammoniac must be slightly increased, and a very little sulphur must be added. This addition causes quicker setting, but reduces the strength. The power of these lutes is dependent upon the oxidation and consequent expansion of the mass, therefore the less foreign matters they contain, the better. They should be made up only as they are required, as they spoil rapidly; when containing much sulphur they may become quite hot in a few hours, and combustion has been known to take place in them when left together in quantity for a night.

18. Finely sifted iron filings 60 parts, finely powdered sal ammoniac 2 parts, flowers of sulphur 1 part. This powder is made into a paste with water, and immediately applied. It soon sets as hard as the iron it is intended to lute.

19. For Iron Pots and Pans.—2 parts sulphur, 1 part of graphite; the sulphur is held in an old iron pan over the fire till it begins to melt; the graphite is then added, and the mass well stirred till thoroughly melted and combined, then poured out on an iron plate or smooth stone, and broken up when cold. Used like solder with a soldering iron. Holes should first be filled with a rivet, and then cemented over.

Iron to Stone.—1. Use plaster of Paris mixed with water and add iron filings, 1 of iron to 6 of plaster.

2. Mix into a paste with water, 3 lb. plaster of Paris and 1 lb. iron filings.

Iron and Blood Cement.—100 parts of pulverized lime, triturated with bullock's blood, 290 parts cement, and from 5 to 10 parts iron filings.

Ivory, Cement for.—1. Dissolve 1 part of isinglass and 2 parts of white glue in 30 parts of water; strain, and evaporate to 6 parts. Add one-thirtieth part of gum mastic, dissolved in ½ part of alcohol; add 1 part of zinc white. When required for use, warm and shake up.

2. Moisten thoroughly a small quantity of very finely powdered quicklime with white of egg to form a paste. Use at once, clamp parts firmly together and leave for 24 hours. Use as little cement as possible.

Jannin's Cement.—This is known as Jannin's cement, from the name of the patentee, a resident of Paris. The cement is simply a mixture, in suitable proportions, of yellow oxide of lead (the quality known as massicot being preferable) with glycerine. Several other metallic oxides and matters may be mixed with the cement, so as to suit the quality or the color of the cement to the nature of the work to be produced, but the two essential compounds are yellow oxide of lead and glycerine. The proportions of oxide of lead and glycerine vary according to the consistency of the cement it is desired to produce. The proportion of glycerine will of course be larger for a very soft cement than for a stiff cement; it is not necessary, therefore, to specify the exact proportion of each of the two essential compounds. This cement is specially adapted for moulding those objects which require an extreme delicacy in the lines of the cast, such as engraved blocks and plates, forms of printing type, photoglyptic plates, etc. Under the influence of gentle heat it sets in a few minutes, and then resists perfectly both pressure and heat. When set, it is also a very good substitute for natural lithographic stones, and it can replace them for many practical purposes. It can also be used for artistic reproductions, such as fac-similes of terra cotta, whose color and sonorous quality it possesses. Though setting to great hardness in a few minutes, it does not shrink.

Japanese Cement.—Mix the best powdered rice with a little cold water, then gradually add boiling water until a proper consistence is acquired, being particularly careful to keep it well stirred all the time; lastly, it must be boiled for one minute in a clean saucepan or earthen pipkin. This glue is beautifully white and almost transparent, for which reason it is well adapted for fancy paper work, which requires a strong and colorless cement.

Jet, Cement for.—Shellac is the only cement used by jewelers for jet. The broken edges should be made warm before applying the shellac. Should the joint be in sight, by smoking the shellac before applying it, it will be rendered the same color as the jet itself.

Jewelers' Armenian Cement.—Isinglass, dissolved in alcohol, 3 oz. (thick); add to this 15 grn. pale gum ammoniac (in tears); add 9 large tears gum mastic, dissolved in as little alcohol as possible. Keep closely stopped. This cement dries colorless.

Jewelers' Turkish Cement.—1. Isinglass, 3 oz.; best gum arabic, 1½ oz. Put in a bottle, cover with alcohol, cork loosely. Put the bottle in water and boil until a thorough solution is made. Strain. A good cement.

2. Isinglass, 50 parts; mastic varnish, 25 parts. Dissolve the isinglass in as little water as possible, adding some strong spirit of wine. The mastic varnish is made by pouring rectified spirit of wine and benzine over finely powdered mastic. Use as small a quantity of the solvent as possible in dissolving this. Pour the solutions together and mix thoroughly.

Jewelers' Cement.—This is the *Armenian* or *Diamond Cement*, which see.

Joints.—A permanent and durable joint can be made between rough cast iron surfaces by the use of asbestos, mixed with sufficient white lead to make a very stiff putty. This will resist any amount of heat, and is unaffected by steam or water.

Keene's Marble Cement.—Baked gypsum or plaster of Paris, steeped in a saturated solution of alum and then recalcined and reduced to powder. For use, mix up with water the same as plaster of Paris. This important cement will not stand the weather, but is admirably adapted for applying as a stucco.

Kerosene Lamps, Cement for. See *Lamps.*

Kitton's White Lead Cement.—(*Month. Mic. Journ.*, 1876, p. 221). Equal parts of white lead, red lead and litharge (all in powder), ground together with a little turpentine until thoroughly incorporated, then mixed with gold size. The mixture should be thin enough to work with a brush. No more of the cement should be made than is required for present use, as it soon sets and becomes unworkable; but a stock of the materials may be kept ready ground in a bottle. For microscopical use.

Labels, Cements or Mucilages for Attaching to Tin.—1. 4 parts shellac, 2 parts borax; water, 30 parts; boil until the shellac is dissolved.

2. Add 4 oz. dammar varnish to 1 lb. of tragacanth mucilage.

3. Balsam of fir, 1 part; turpentine, 3 parts; use only for varnished labels.

4. Butter of antimony is good to prepare the tin for the label.

5. Venice turpentine added to good starch paste makes an excellent mounting medium.

6. Use liquid glue or glue dissolved in acetic acid.

7. Add 1 oz. of tartaric acid to each lb. of flour used in making flour paste.

8. Add 10% flour to tragacanth mucilage.

9. Corrosive sublimate, 125 parts; wheaten flour, 1,000 parts; absinthe, 500 parts; tansy, 500 parts; water, 15,000 parts. This cement is useful for vessels which are kept in a damp place.

10. Starch, 100 parts; strong glue, 50 parts; turpentine, 50 parts; the whole boiled in water. This cement dries quickly.

Labels, Cement for. See **Pastes,** and also *Buckland's Cement*; also *Nickel.*

Laboratory, Chemical Cement, or Chemical Mastic.—Equal parts of pitch, rosin and plaster of Paris (thoroughly dried); mix together. Used for the masonry of chlorine chambers, vitriol works, etc.; and as a lining for casks intended to hold chloride of lime.

Lamps, Kerosene, Cement for.—A cement particularly adapted for attaching the brass works to petroleum lamps is made by boiling 3 parts resin with 1 part of caustic soda and 5 parts of water. The composition is then mixed with half its weight of plaster of Paris. It sets firmly in a half to three-quarters of an hour. It is said to be of great adhesive power, not permeable to petroleum, a low conductor of heat, and but superficially attacked by hot water. Zinc white, white lead, or precipitated chalk may be substituted for plaster, but hardens more slowly. See also *Petroleum-resisting Cement.*

Leather Cement. See also *Belting* and *Gutta Percha Cements.*—1. A good cement is gutta percha dissolved in bisulphide of carbon, until it is of the thickness of molasses; the parts to be cemented must first be well thinned down, then pour a small quantity of the cement on the parts to be cemented, spreading it well so as to fill the pores of the leather; warm the parts over a source of heat for about half a minute, apply them quickly together, and press hard. The bottle containing the cement should be tightly corked and kept in a cool place.

2. This is made by mixing 10 parts of bisulphide of carbon with 1 part of oil of turpentine, and then adding enough gutta percha, cut into small pieces, to make a tough, thickly-flowing liquid. One essential prerequisite to a thorough union of the parts consists in freedom of the surfaces to be joined from grease. This may be insured by laying a cloth upon the part to be joined, and applying a hot iron for a time. The cement is then applied to both pieces, the surfaces brought in contact, and pressure applied till the joint is dry.

3. 16 parts of gutta percha, 4 parts of gum rubber, 2 parts of yellow pitch, 1 part of shellac, melted together with 2 parts of linseed oil.

4. 1 lb. gutta percha, 4 oz. India rubber, 2 oz. pitch, 1 oz. shellac, 2 oz. linseed oil; melted together; it hardens by keeping, and needs remelting for use.

5. Leather to Metal.—Melt together equal parts asphalt and gutta percha, and apply hot under a press.

6. F. Sieburger recommends the following process by Fuchs: Digest 1 part crushed nutgalls with 8 parts distilled water for six hours, and strain; macerate glue with its own weight of water for twenty-four hours, and dissolve; spread the warm infusion of the galls on the leather, and the glue on the roughened metallic surface; apply the prepared surfaces together, and dry gently; the leather then adheres so firmly to the metal that it cannot be removed without tearing.—*Polyt. Notizblatt.*

7. Leather to Pasteboard.—Strong glue, 50 parts, is dissolved with a little turpentine in a sufficiency of water, over a gentle fire; to the mixture is added a thick paste made with 100 parts of starch. It is applied cold, and dries rapidly.

8. Soak the leather in a hot infusion of nutgalls, coat the metal with gelatine, and bring them together.

9. Leather and Pasteboard, Cement for.—Strong glue, 50 parts, is dissolved with a little turpentine in q. s. water, over a gentle fire; to the mixture is added a thin paste, made with 100 parts of starch. It is applied cold, and dries rapidly.

10. Leather on Pop Rollers, Cement to Fasten.—Gum arabic, 5½ oz.; isinglass, 5½ oz. Dissolve separately in water and mix.

Lenses, to Cement.—In those of foreign make, an arborescent appearance is occasionally to be seen between the elementary parts of which the lens is composed. This arises from the drying or shrinking of the balsam with which it is cemented. To remedy this, unset the lens, place it in warm water, which may be still further heated till the balsam softens, separate the components, and clean with ether, benzole, or turpentine. Next place a drop of pure balsam on the center of the concave surface, and gently press the convex one down upon it until the balsam spreads and oozes out at the edges. Then apply a gentle heat until the balsam is found to have been hardened.

Letter-fixing Cement.—Copal varnish, 15 parts; drying oil, 5 parts; oil of turpentine, 2 parts; liquefied glue (made with the least quantity of water), 5 parts; melt together in a water bath, and add fresh slaked lime (perfectly dry, and in very fine powder), 10 parts. Used to attach metal letters to plate glass in shop windows.

Letters, Metal, Cementing to Glass.—Copal varnish, 3 parts; linseed oil varnish, 1 part; oil of turpentine, 1 part; glue, 1 part. Use best Canada balsam. Add carpenter's glue, 2 oz.; Venice turpentine, ½ oz.

Lime Cements.—Lime cements are very valuable in mending many articles and when combined with casein, sodium silicate, or egg, produce one of the simplest and most durable cements for household use.

Lime Cement used by Joiners.—Mix 20 parts flour, 10 parts slaked lime, and 3 parts linseed oil varnish.

Lime and Glue Cement.—Into hot glue stir air-slaked lime. This gives a good cement and very cheap.

Linseed Oil Cements.—Linseed oil, 25 parts; boil with 35 parts litharge and 250 parts finely powdered burned lime. Use hot. Used for jointing stones, etc.

Liquid Cement or Glue.—1. To make 1 gal. of the gum, about 1½ gal. of water, 3 lb. of glue, 4 oz. of borax, and 2 oz. of carbonate of soda, or an equivalent of any other alkali, are taken. The glue and alkaline salts are dissolved in the water by heat, and the solution is kept at a temperature a few degrees below boiling point for 5 or 6 hours. The continued application of heat renders the gum permanently liquid at the ordinary temperature. After allowing the sediment to settle, the clear liquid is evaporated to the required consistency.

2. Soak gelatine in water, melt at a low heat and add strong vinegar or acetic acid until it remains liquid when cold.

Litharge Cement.—Litharge, 1 oz.; plaster of Paris, 1 oz.; finely powdered resin, ⅛ oz.; mix thoroughly, and make into a paste with boiled linseed oil to which driers have been added. Beat it well, and let it stand four or five hours before using. Soda silicate and chalk make a good cement.

Litharge and Glycerine Cement.—A cement made of very finely powdered oxide of lead (litharge) and concentrated glycerine unites wood to iron with remarkable efficiency. The composition is insoluble in most acids, is unaffected by the action of moderate heat, sets rapidly, and acquires an extraordinary hardness.

London Cement.—The London cement for joining broken glass, china, wood, etc., is made by taking a piece of Gloucester cheese, boiling it three times in water, each time allowing the water to evaporate, and mixing the paste thus left with dry quicklime.

Lovett's Cement, used by Microscopists.—Powdered white lead, 2 parts; powdered red lead, 2 parts; powdered litharge, 3 parts; gold size. The white and red lead and the litharge must be very finely powdered; for use this powder is mixed with gold size to the consistency of cream, and the cells immediately fastened to the slide. They are secure in two weeks. This stands considerable heat and is excellent for fluids containing some alcohol. Make a little only of the mixture with gold size at a time, as it hardens quite rapidly and becomes useless.

Lutes.—A lute is a tenacious and ductile composition becoming solid on drying, employed to secure the joints of vessels intended to be subjected to corrosive influence, such as heat, water, steam, acids, and gases, and to prevent the escape of liquid or volatile bodies. Besides the lutes mentioned below others will be found in other portions of the cement division of this book. As: Acid-proof, aquariums, cap, chemical, coppersmiths', fireproof, iron, laboratory, Massiat's, putties, Serbat, steam, and waterproof.

Algerian.—1. Wood ashes, 2 parts; lime, 3 parts; sand, 1 part; mixed, passed through a sieve, moistened with water and oil, and beaten up with a wooden mallet till the compound has acquired the right consistence.

2. Ground almond cake as before or linseed cake is added to starch, paste and gum water.

Almond Paste.—Ground almond cake from which the oil has been expressed is mixed with an equal weight of whiting and made into a paste with water. It is employed where the heat does not exceed 320° F.

Fat Lute.—Clay is powdered, sifted, placed in an iron mortar, and incorporated with drying oil, added gradually, the whole being beaten up till the mass assumes the consistence of a fine paste. It should be preserved under a coating of oil to prevent it drying up. It resists the action of corrosive gases, but softens on exposure to heat.

Plaster of Paris mixed with water, milk, or weak glue stands a dull red heat.

Crucible Lute.—Make a paste of freshly slaked lime and a concentrated solution of borax. Let it get thoroughly dry.

Lutes for Crucibles.—Powdered clay and brick dust mixed up with a solution of borax in water.

Dihl's Lute.—A mixture of boiled linseed oil, litharge, and powdered china clay. The whole is made into a paste and applied with a trowel. The surfaces of the joint must be previously thoroughly cleaned and dried.

Lutes.—1. Linseed meal, either alone or mixed with an equal weight of whiting, and made into a stiff paste with water. It soon becomes very hard and tough.

2. Fresh slaked lime made into a paste with strained bullock's blood, or size. Used as the last.

3. Plaster of Paris made into a paste with water and at once applied. It bears nearly a red heat, but becomes rather porous and friable; use screws or clamps.

4. Powdered clay or whiting made into putty, with water and boiled linseed oil. This is commonly known as "fat lute."

5. A mixture of powdered clay and ground bricks, made up with water or a solution of borax. For joining crucibles, etc., which are to be exposed to a strong heat.

6. Pipe clay and horse dung made into a paste with water. As a coating for glass vessels, to preserve them from injury from exposure to the fire. This composition is used by pipe makers, and will stand unharmed the greatest heat of their kilns for 24 hours. It is applied by spreading it on paper.

7. As the last, but employing shredded tow or plumbago for horse dung. For the joints of small vessels, as tubes, etc., especially those of glass or earthenware, pieces of vulcanized India rubber tubing slipped over and tied above and below the joint, are very convenient substitutes for lutes. Flat rings or "washers" of vulcanized rubber are excellent for still heads, when the parts can be pinched together by clamps.

Glass, Lute for.—As a coating for glass vessels, to protect them from injury during exposure to the fire, pipe clay and horse dung are made into a paste with water. This composition is applied by spreading it on paper. Shredded tow or plumbago is substituted for the horse dung.

Lute for Stills or Retorts.—(Lemery's.) Fine lime, ½ oz.; fine flour, ½ oz.; potter's earth, ¼ oz.; make a moist paste of this, with white of egg, beaten up with a little water. This will stop retorts very closely.

Lute for Retorts.—(Boyle's.) Pound in a mortar some fine quicklime, and scrapings of cheese, water q. s. to make a soft paste. Spread on a linen rag, and apply.

Water Gutters, Lute for.—Tar, 1 part; tallow, 1 part; fine brick dust, 1 part; the latter is warmed over a gentle fire, the tallow is added, then the brick dust, and the whole is thoroughly mixed. It must be applied while hot.

Wooden Vessels, Lute for.—A mixture of lime, clay, and oxide of iron, separately calcined, and reduced to fine powder, then intimately mixed, kept in a closed vessel, and made up with the requisite amount of water when wanted.

Mahogany Cement.—1. Melt beeswax 4 oz.; then add Indian red 1 oz., and enough yellow ocher to produce the required tint.

2. Shellac, melted and colored as above. Very hard. Used to fill up holes and cracks in mahogany.

Marble, Cements for.—See Alabaster and Keene's Cement. Also Marble Cement. 1. Take plaster of Paris, and soak it in a saturated solution of alum, then bake in an oven, the same as gypsum is baked to make it plaster of Paris; after which grind the mixture to powder. It is then used as wanted, being mixed up with water like plaster and applied. It sets into a very hard composition capable of taking a very high polish, and may be mixed with various coloring minerals to produce a cement of any color capable of imitating marble.

The *Eng. Mech.* gives these three recipes:

2. Melt together 8 parts of resin and 1 of wax; when melted, stir in 4 or 5 parts of plaster of Paris. The pieces to be joined should be made hot.

3. Procure a small piece of quicklime fresh from a newly burnt kiln, slake with a white of an egg, wash the fractured parts quite clean, and apply.

4. Soak plaster of Paris in a saturated solution of alum, bake in an oven, reduce it to powder, mix with water, and apply; it sets like granite.

5. Mix 12 parts of Portland cement, 6 parts of slate lime, 6 parts of fine sand and 1 part of infusorial earth, and make up into a thick paste with silicate of soda. The object to be cemented does not require to be heated. It sets in twenty-four hours, and the fracture cannot be readily found.

6. Make a thick mucilage of ½ oz. of gum arabic, add 1½ oz. dental plaster, and finally ½ oz. finely powdered quicklime; mix well. When required for use heat the marble.

7. Coat the marble with linseed oil varnish; then apply the following cement: brick dust 10 parts; litharge (elutriated), 1 part; linseed oil varnish, 2 parts; work up into a stiff putty.

8. Mix litharge and freshly burned lime in the proportion 20 to 1. Make into a putty with q. s. of linseed oil.

9. Lac colored to imitate the marble; may be mixed with marble dust passed through a silken sieve.

10. W. F. Reid gives the following details for it. Begin with the raw gypsum in lumps of moderate size, burning them at the usual temperature (below red heat). The solution of alum should contain 1 part of this salt in 10 parts of water. There is no difficulty in dissolving this quantity if the water be previously heated and the alum coarsely pulverized. By immersing the lumps of burnt gypsum in this solution while they are still warm, and leaving them in it for about fifteen minutes, they will become thoroughly saturated with the liquid. They should then be allowed to drain and again burnt, but this time at a red heat. Gypsum which has been treated in this way forms, when pulverized, a slow-setting cement which ultimately attains great hardness, and has frequently been used for making paving tiles, especially in Italy.

11. Into a solution of chloride of zinc, sp. gr. 1·490 to 1·652, is introduced 3% of borax or sal ammoniac; when this is dissolved, oxide of zinc, which has been subjected to a red heat, is added, till the mass attains the desired consistence. This cement becomes as hard as marble, and may be used for moulding.

12. 12 parts Portland cement, 6 parts slaked lime, 6 parts fine sand, 1 part infusorial earth, and mix into a thick paste with silicate of soda. The object to be cemented need not be warmed. The cement sets in twenty-four hours, and the fracture can then hardly be detected. The cemented portions are harder than the rest, and

the fracture cannot by any chance be reopened. —*Polytech. Centralblatt.*

Marine Glue.—Caoutchouc, 1 oz.; genuine asphaltum, 2 oz.; benzole or naphtha, q. s. The caoutchouc is first dissolved by digestion and occasional agitation, and the asphaltum is gradually added. The solution should have about the consistency of molasses.

Marteaux & Robert's Cement.—Pyrolusite finely powdered 100 parts, graphite 12 parts, white lead 5 parts, red lead 5 parts, clay 3 parts. After sifting and mixing, 1 part of boiled linseed oil to each 7 parts of the mixture are added. Make into a paste, heat and pound; repeat the operation several times.

Martin's.—This is manufactured in the same way as Keene's, only carbonate of soda or carbonate of potash is used as well as alum, and the burning is carried on at a higher temperature.

Mason's.—1. 20 lb. clean river sand, 2 lb. litharge, 1 lb. quicklime, sufficient linseed oil to form a thin paste. Used for joining fragments of stone.

2. Gad's.—3 parts well dried and powdered clay, 1 of iron oxide, mixed together and made into a stiff paste with boiled oil. Used for work required to harden under water.

3. For Grotto Work.—Commonest sealing-wax.

4. An excellent cement for foot walks, and for all uses which require exposure to the weather or to dampness, is described in "Der Praktische Maschinen-Constructeur." It is made by thoroughly stirring Portland cement or good hydraulic lime into a warm solution of glue, so as to make a thick paste, and applying it immediately. In three days it acquires extraordinary hardness and tenacity. It is an excellent cement for joining the procelain heads to the metal spikes which are used as ornamental nails,

5. Fahnejelm recommends a mixture of 75 parts of carefully washed chalk and 25 parts of washed kaolin, to be first calcined to red heat, and afterward ground. The powder is then snow-white, or, if the heat has been too great, it has a bluish shade. Either alone, or with a small percentage of gypsum, it makes an excellent hydraulic cement.

6. 1 part yellow Botany Bay gum, 1 part brick dust, melted together. For stoneware.

7. 60 parts chalk. 20 parts lime, 20 parts salt, 10 parts Barnsey sand, 5 parts iron filings, 5 parts clay; ground together, and calcined. Beale's.

8. 3 parts clay, 1 part slaked lime; mixed, exposed for three hours to full red heat, and ground to powder. Bruyere's hydraulic.

Massiat's Cement.—Melt rubber with 10 to 20% tallow or beeswax. Gradually add finely pounded quicklime. Used to cover bungs.

Mastic Cement.—1. Mastic cement is used for moulding ornaments, etc. Reduce all materials to fine powder. Quartz sand, 60 pts.; limestone 20 pts.; litharge, 10 pts.; linseed oil, 7 pts.

2. Powder slaked lime 30 parts; sand 17½ parts; litharge 1½ parts. Knead to a stiff mass with 3½ to 5 parts old linseed oil, or linseed oil varnish may be used. Work thoroughly in a mortar with a pestle.

Meerschaum, Cement for.—1. Take some garlic and crush it in order to form a kind of dough, rub over the broken pieces of meerschaum with it and reunite them by pressing very closely, bind them with iron wire according to the strength of the pieces, and finally boil them for half an hour in a sufficient quantity of milk. Casein and quicklime cements apply here.

2. Dissolve casein in a solution of water glass (silicate of soda) and stir into it calcined magnesia and use at once. Casein is prepared by allowing perfectly skimmed milk to stand until it curdles, when the casein is filtered out and washed on the filter. To simplify above a little fresh cheese may be boiled in water and mixed with slaked lime and ashes, using 10 parts cheese, 20 parts water, 2½ parts lime, and 2 parts wood ashes.

Metallic Cement.—1. From 20 to 30 parts of finely divided copper, obtained by the reduction of oxide of copper with hydrogen, or by precipitations from solutions of its sulphate with zinc, are made into a paste with oil of vitriol, and 70 parts of mercury added, the whole being well triturated. When the amalgamation is complete the acid is removed by washing with boiled water, and the compound allowed to cool. In ten or twelve hours it becomes sufficiently hard to receive a brilliant polish, and to scratch the surface of tin or gold. By heat it assumes the consistence of wax, and, as it does not contract by cooling, it is recommended by a noted chemist for dentists' use for stopping teeth. This is a splendid cement for attaching to the surface of wood, glass, metal and porcelain.

2. The following recipe for a metallic cement for repairing broken stone is given by Prof. Brune, of the School of Fine Arts. It was used in the restoration of the colonnade of the Louvre, of the Pont Neuf, and of the Conservatoire des Arts et Metiers. It consists of a powder and a liquid. The Powder.—2 parts by weight of oxide of zinc, 2 parts of crushed limestone of a hard nature, and 1 part of crushed grit, the whole intimately mixed and ground. Ocher in suitable proportions is added as a coloring matter. The Liquid.—A saturated solution of zinc in commercial hydrochloric acid, to which is added a part, by weight, of hydrochlorate of ammonia equal to ¼ that of the dissolved zinc. This liquid is diluted with ⅔ of its bulk of water. To use the cement, 1 lb. of the powder is to be mixed with 2½ pt. of the liquid. The cement hardens very quickly and is very strong.

Metals, to Cement. See also *Iron Cement* and *Litharge Cement.*

Casein, Cement for.—Mix with water quartz sand (elutriated), 5 parts; casein, 4 parts; lime (slaked), 5 parts.

Any fibrous material can be stuck to metal, whether iron or other metal, by a mixture composed of good glue dissolved in hot vinegar with ⅓ of its volume of white pine pitch, also hot. This composition, it is said, will give a sure and certain result.

Metal Letters on Glass, Marble, Wood, etc., Cement for Fastening.—1. Copal varnish, 30 parts; linseed oil varnish, 10 parts; oil of turpentine, 10 parts; glue, 10 parts. Place the mixture in a water bath, to dissolve the glue, then add 20 parts slaked lime.

2. Copal varnish, 15 parts; drying oil, 5 parts; turpentine, 3 parts. Melt in a water bath, and add 16 parts slaked lime.

3. Into melted resin, 180 parts, are stirred burnt umber, 30 parts; calcined plaster, 15 parts; boiled oil, 8 parts.

4. Rosin, 4 to 5 parts; wax, 1 part; colcothar, 1 part; the whole melted together. A little powdered plaster is often added.

5. Sandarac or galipot varnish, 13 parts; boiled linseed oil, 5 parts; turpentine, 2½ parts; essence turpentine, 2½ parts; marine glue, 5 parts; pearl white, 5 parts; dry carbonate of lead, 5 parts; mixed.

6. Copal or lac varnish, 15 parts; drying oil, 5 parts; India rubber or gutta percha, 4 parts; coal oil, 7 parts; Roman cement, 5 parts; plaster, 5 parts.

7. Copal or rosin varnish, 15 parts; turpentine, 2½ parts; essence turpentine, 2½ parts; fish isinglass (in powder), 2 parts; iron filings, 3 parts; ocher or rotten stone, 10 parts. These cements are much used for fixing metallic letters to glass, marble, or wood. The two following are particularly good for uniting brass and glass:

8. Caustic soda, 1 part; rosin, 3 parts; plaster, 3 parts; water, 5 parts; the whole is boiled. This compound hardens at the end of half an hour; the hardening may be retarded by replacing

the plaster by zinc white, white lead, or slaked lime.

9. Fine litharge, 2 parts; white lead, 1 part; copal, 1 part; boiled linseed oil, 3 parts; the whole is triturated together. Dissolve by heat.

10. For joining metallic surfaces where soldering is inconvenient, recourse may be had to a composition formed in the following way: Pure and finely divided copper, such as that obtained by the reduction of sulphate of copper with zinc clippings, 20 to 36 parts, according to the degree of hardness desired in the cement, dissolved in a sufficient quantity of sulphuric acid to make a thick paste; with this is incorporated, by trituration in a mortar, mercury, 70 parts. The mass is soft, but hardens at the end of some hours. For use it is heated to 212° F. (100° C.), and powdered in an iron mortar heated to 302° F. (150° C.); it then assumes the consistence of wax, and is harder in proportion, as it contains more copper.

Metal, Cement for.—Melt over a water bath 30 parts copal varnish, 10 parts drying oil, 6 parts turpentine; when melted add 20 parts slaked lime.

Metal and Rubber, Cement for.—Powdered shellac is softened in ten times its weight of strong water of ammonia, whereby a transparent mass is obtained, which becomes fluid after keeping some little time without the use of hot water. In three or four weeks the mixture is perfectly liquid, and, when applied, it will be found to soften the rubber. As soon as the ammonia evaporates the rubber hardens again—it is said, quite firmly—and thus becomes impervious both to gases and to liquids. For cementing sheet rubber, or rubber material in any shape, to metal, glass, and other smooth surfaces, the cement is highly recommended.

Metal Sheets, Thin, to Cement.—Dissolve isinglass, cut fine, in warm water, and add a little nitric acid. If more acid is used than is necessary the cement will not dry.

Metal, Linseed Oil Cement for.—Linseed oil and well slaked lime are made into a paste. Great pressure must be used.

Metal to Porcelain, Glass, etc.—Dissolve good glue in water, heat and add ½ as much linseed and varnish and ¼ as much Venice turpentine as the amount of glue used.

Mica, Cement for.—A colorless cement for joining sheets of mica is prepared as follows: Clear gelatine is softened by soaking it in a little cold water, and the excess of water is pressed out by gently squeezing it in a cloth. It is then heated over a water bath until it begins to melt, and just enough hot proof spirit (not in excess) stirred in to make it fluid. To each pint of this solution is gradually added, while stirring, ¼ oz. of gum ammoniac and 1½ oz. of gum mastic previously dissolved in 4 oz. of rectified spirit. It must be warmed to liquefy it for use and kept in stoppered bottles when not required. This cement, when properly prepared, resists cold water.

Microscope Cement.—Put into a bottle 2 parts of isinglass and 1 part of gum arabic, cover them with proof spirit, cork the bottle loosely, and place it in a vessel of water, and boil it till a thorough solution is effected, when it must be strained for use. This is a highly valuable cement for many purposes, and is used for mounting opaque objects for the microscope.

Minerals, Fossils, etc.—1. Use best fish glue (hot) and tie well.

2. Starch, ¼ oz.; white sugar, 1 oz.; gum arabic, ¼ oz. Dissolve the gum in a little hot water, and the sugar and starch, and boil until the starch is cooked.

Mohr's.—Equal parts of pulverized brick and litharge are made into a paste with linseed oil. After application a little fine sand is dusted over the lute, and it is dried in the oven.

Mortar. See **Mortars.**

Muirhead's Cement.—3 lb. Portland cement, 3 lb. of sharp sand, 4 lb. of blacksmith's ashes, 4 lb. of resin. Melt the resin and stir the other ingredients in.

Naturalists'.—Consists of mucilage of gum arabic, thickened with starch powder or farina, with the addition of a little lemon juice. Sometimes the mucilage is used alone. This cement is employed by naturalists, for mounting specimens; by artificial flower makers; by confectioners, to stick ornaments on their cakes, etc.

Nickel, Cementing Labels on.—Dissolve 40 parts dextrin in 50 of water, 2 of glycerine, and 1 of glucose, and heat.

Oil Cements are useful, but require a long time to harden. See also linseed oil, litharge, Serbat's and Stephenson's cement.

Oil Cement for Steam Pipes.—1. Barytes (heavy spar) finely powdered, 8 parts; graphite, 6 parts; lime (slaked), 3 parts; boiled linseed oil, 3 parts.

2. 100 parts red lead, 250 parts white lead, 200 parts pipe clay. Mix with boiled oil.

Oil Proof Cement.—"The hardest cement is produced by triturating 50 grm. (grammes, not grains) of litharge with 5 cubic centimeters of glycerine; if more glycerine is used, the mass hardens much more slowly and imperfectly. The small proportion of glycerine, however, makes it impracticable to prepare large quantities of the cement at a time. For this purpose it will be necessary to take more glycerine. . . . The most favorable results are obtained by adding 2 volumes of water to 5 volumes of glycerine (s. g. 1·240). Six cubic centimeters of this liquid are incorporated with 50 grm. of litharge. This mass requires a shorter time than any other proportions to produce a hard cement, ten minutes only being required to harden moderately, while after two hours it becomes harder than any mixture containing glycerine and litharge alone; but after a few days the latter compound (prepared without water) overtakes the former in hardness, and remains so. If it is desired to produce a cement which rapidly hardens and still have considerable firmness, it is advisable to use water with the glycerine."

Cement, Opticians'.—1. Shellac softened with rectified spirit or wood naphtha. For fine work.

2. Beeswax, 1 oz.; rosin, 15 oz. Melt and add whiting (previously made red hot, and still warm) 4 oz.

3. Rosin, 1 lb.; melt and add plaster of Paris (dry) 4 oz. The above are used to fix glasses, stones, etc., while polishing and cutting them. The last is a very strong cement for rough purposes.

4. 10 parts rosin, 2 parts shellac, 1 part rouge. Melt, mix, and add enough turpentine to make it tough, so as not to splinter under pressure from the thumb nail, at the working temperature of the room.

Paper (Parchment) to Cement.—Mix ordinary glue with about 3% of potassium or ammonium dichromate in the dark. This may be used on the paper, and after exposure to light becomes perfectly insoluble in boiling water. This glue has been very largely used in Germany for joining the parchment paper envelopes of pea sausages. The strips of paper joined by this glue are dried quickly and exposed to light till the glue changes to a brownish color; they are then boiled with water containing about 3% of alum till all the excess of alkaline dichromate is extracted, and then washed in water and dried.

Paper, to Fasten to Stone.—Melt together equal parts of asphalt and gutta percha. Use hot. The surfaces to be joined should be perfectly clean and dry.

Parabolic.—Syn. Universal Cement. Curdle skim milk, press out the whey, and dry the curd by a gentle heat, but as quickly as possible. When it has become quite dry, grind it to powder in a coffee or pepper mill, and mix it with ⅛ of its weight of finely powdered quicklime, and a piece of camphor the size of a pea, also

reduced to powder, to every ounce of the mixture. Keep it in wide mouth 1 oz. vials, well corked. For use, make it into a paste with a little water, and apply it immediately.

Parian Cement is also made in the same way as Keene's, but with the use of a solution of borax, the biborate of soda, in place of alum. All these cements are capable of receiving a high degree of polish, and as they dry very rapidly can be painted over within a few days.

Paris Cement for Mending Shells and Other Specimens.—Gum arabic, 5 parts; sugar candy, 2 parts; white lead, enough to color.

Pasteboard, to Cement.—Good pitch and gutta percha (about equal parts) are fused together, and to 9 parts of this are added 3 parts of boiled oil and ¼ part of litharge; continue the heat with stirring until thorough union of the ingredients is effected. This is applied hot or cooled somewhat, and thinned with a small quantity of benzole or turpentine oil.

Peasley Cement.—The exact composition of this cement is unknown, but it is without doubt a modification of the Armenian cement, which see.

Pen's Cement for Covering Buildings, etc.—Powdered quicklime, 1 part; powdered baked clay, 2 parts; mix, then add 1 part of freshly baked and powdered gypsum to 2 parts of powdered baked clay, and after mixing well add them to the former powder, and thoroughly incorporate the two. Used to cover buildings. It is mixed up with water and applied like mortar. It acquires great hardness, and is very durable.

Petroleum Cement.—1. Dissolve 5 parts of shellac and 1 part of turpentine in 15 parts of petroleum. This cement is fairly elastic.

2. A cement particularly adapted for attaching the brasswork to petroleum lamps is made by Puscher, by boiling 3 parts resin with 1 part of caustic soda and 5 parts of water. The composition is then mixed with half its weight of plaster of Paris, and sets firmly in half to three-quarters of an hour. It is of great adhesive power, and not permeable to petroleum, a low conductor of heat, and but superficially attacked by hot water. Zinc white, white lead, or precipitated chalk may be substituted for plaster, but hardens more slowly.

Pew's Cement.—Prep. Powdered quicklime, 1 part; powdered baked clay, 2 parts; mix, then add 1 part of freshly baked and powdered gypsum to 2 parts of powdered baked clay, and after mixing well add them to the former powder and thoroughly incorporate the two. Used to cover buildings. It is mixed with water, and applied like mortar. It acquires great hardness and is very durable.

Pipes, Cement Used for Uniting Large.—1. 12 parts Roman cement, 4 parts white lead, 1 part litharge, ½ part rosin are pulverized and mixed. From 2½ to 3 lb. of the mixture is triturated with old linseed oil in which is boiled 1 oz. resin.

2. Equal parts of burnt lime, Roman cement, potter's clay and ordinary clay, separately well dried, finely ground, sifted, well mixed, and triturated with linseed oil.

3. 2 parts red lead, 5 parts white lead, and 3 parts of the finest clay. Mix with boiled linseed oil.

Pipes, Water, Glass Cement for.—This cement stands an intense heat. Mix 10 parts zinc white, 8 parts hydrolusite, and 2 parts sodium silicate.

Pipes, Cement for.—A cement, impermeable by air and steam, and especially well adapted to use for steam or gas pipes, is made of powdered graphite 6 parts, slaked lime 3 parts, sulphate of lime 8 parts, and boiled oil 7 parts; well kneaded.

Oil, Cement for.—Litharge 5 parts, lime (air slaked) 2 parts, quartz sand 2 parts.

Waterproof Cement for Cast Iron Pipes, etc.—Take equal weights, in dry powder, of burnt lime, Roman cement, pipe clay and loam, and knead the whole with about one-sixth the weight of linseed oil. The addition of more Roman cement improves the quality. See also red lead and rust cements.

Cement Pipe.—The proper proportion for cement pipe is 1 of water cement to 3 of sand. Gravel from the size of a pigeon's egg down is better than fine sand, and it must be perfectly clean and free from mould or vegetable matter. The cement and sand must be thoroughly mixed before the water is added, and it must be used immediately after mixing. The most common cause of failure is a poor quality of cement.

Plaster Cement.—1. Plaster of Paris, baked and ground, acquires great hardness and solidity when left for twenty-four hours in contact with a solution of alum, and when, after drying in the air, it is submitted to a second baking.

2. Still better results are obtained by employing an aqueous solution containing $\frac{1}{10}$ of borate and $\frac{1}{10}$ of cream of tartar; the plaster, baked and in fragments, is plunged into this solution until it is saturated; then it is calcined and pulverized.

3. A mixture of silicate of potash, 100 parts; carbonate of potash, 27 parts; and water, 500 parts, may also be used.

4. Plaster of Paris busts, etc., are best mended with shellac varnish or soluble glass.

Plumber's Cement.—Black resin, 1 part; brick dust, 2 parts; well incorporated by a melting heat.

Pointing for Buildings.—Use equal parts hydraulic cement (Portland), lime, and fine white sand.

Pollack's Cement for Iron and Stone.—Take litharge and red lead, equal parts; mix thoroughly and make into a paste with concentrated glycerine to the consistency of soft putty; fill the crack and smear a thin layer on both sides of the casting so as to completely cover the fracture. This layer can be rubbed off if necessary when nearly dry by an old knife or chisel. M. Pollack has used it to fasten the different parts of a fly-wheel with great success. This cement is fire and water proof.

Porcelain Letters, Cement for Attaching.—8 parts starch is mixed with 10 parts of chalk (finely powdered), by using equal parts of alcohol and water with the addition of 3 parts of Venice terpentine. See *Glass* above.

Porcelain, Cement for.—See also *Casein* Cements. 1. Add plaster of Paris to a strong solution of alum till the mixture is of the consistency of cream. It sets readily, and is said to unite glass, metal, porcelain, etc., quite firmly. It is probably suited for cases in which large rather than small surfaces are to be united.

2. Use thick white lead paint.

3. Milk is coagulated with acetic acid and the casein thus formed is washed well in water and then dissolved in a cold saturated solution of borax; a clear solution is thus obtained which is superior to gum arabic. For porcelain mix with finely powdered quicklime, apply to the ware immediately, bind with cord and expose to gentle heat.—*Dingler's Poly. Jl.*

4. Into a clear solution of gum arabic stir plaster of Paris; use immediately; water will destroy the joint made by this cement.

5. Yellow gum, 16 parts; fine brick dust, 17 parts; mix.

6. To Resist Heat.—China clay mixed with asbestos. Beat well before applying; use no more water than absolutely necessary. This is said to stand a high heat. Not recommended for household use.

7. Calcine oyster shells; grind and sift; reduce to the very finest powder with a muller, and beat into a paste with white of an egg; press the broken pieces together firmly. This cement stands both heat and water.

8. Stir the white of an egg into a stiff solution of glue.

Sulphur Cement for Porcelain.—Sulphur, 7 parts; white pitch, 5 parts; shellac (bleached)

1 part; mastic, 2 parts; gum elemi, 2 parts; glass meal, 7 parts.

Portland Cement derives its name from its supposed resemblance to Portland stone when used as a stucco upon walls. The materials required in its manufacture are chalk, or any other "rich" limestone, river mud, or clay, and oxide of iron, the proportions in which these materials are mixed varying at different works —from 65 to 80% of limestone and 20 to 35% of clay and iron oxide, which are intimately mixed with water in a mill, then dried slowly on hot plates, and afterward calcined in a kiln, and reduced to fine powder. Before being used the cement should be kept for some months in a dry place, as its cohesive strength is thereby increased. It hardens rapidly when stirred up with water, and possesses great cohesive power, which is diminished by the admixture of sand. When used as a stucco it can be mixed with 3 or 4 parts of sand to 1 of cement, and the setting then proceeds more slowly than if pure cement is used. The sand must be perfectly free from loamy particles, otherwise it will not harden, but will crumble to pieces at the touch. If painted over with oil color soon after it has been laid on a wall, it will peel off and form blisters—probably from the large proportion of quicklime it contains not being thoroughly slaked before it hardened. Some months, therefore, should be allowed to elapse before paint is applied to it.

Pots and Pans, Cement for.—2 parts of sulphur and 1 part, by weight, of fine black lead; put the sulphur in an old iron pan, holding it over the fire until it begins to melt, then add the lead; stir well until all is mixed and melted; then pour out on an iron plate or smooth stone. When cool, break into small pieces. A sufficient quantity of this compound being placed upon the crack of the iron pot to be mended, can be soldered by a hot iron in the same way a tinsmith solders his sheets. If there is a small hole in the pot, drive a copper rivet in it and then solder it over with this cement.

Prisms, Bisulphide of Carbon, Cement for.—For bisulphide of carbon prisms, Mr. Lewis M. Rutherfurd, who has had much experience in this subject, employs a cement of glue and molasses. The surfaces must be perfectly clean; they are then warmed and dusted with a fine camel's hair brush, and placed in contact. A hot and fluid mixture of glue and molasses is then applied around the edges, and penetrates by capillary attraction. It must be left a day or two to harden, before preparing the next side. The ground stopper was also rendered tight by a little molasses. (See Silliman's *American Journal*, March, 1865.) Marine glue is also employed, and we suppose that the cement from glycerine and litharge may be.

Putty may be considered as cement. It is prepared by mixing fine whiting with linseed oil or linseed oil varnish, the latter drying more quickly. The whiting should be passed through a sieve, the meshes being 42 threads to the inch. It should be dry before sifting, and be thoroughly incorporated with the oil, a tedious operation. Keep in oiled paper or under water. White lead is sometimes mixed with the putty. Color if desired with dry colors.

Soft Putty.—1. 10 lb. of whiting and 1 lb. of white lead, mix with the necessary quantity of boiled linseed oil, adding to it ½ a gill of the best olive oil. The last prevents the white lead from hardening and preserves the putty in a state sufficiently soft to adhere at all times, and not, by getting hard and cracking off, suffering the wet to enter, as is often the case with ordinary hard putty.

2. A very strong putty is made of boiled oil and whiting for exposed situations, as skylights, but is not adapted for keeping—it gets too hard.

3. Putty for good inside work is improved by adding white lead.

4. Another putty which requires to be made as wanted (as it gets hard almost immediately) is composed of red lead in powder mixed with boiled oil and turpentine varnish, and is used for fronts of houses or any place requiring a hard putty.

5. Some manufacturers prepare an oil for the purpose by melting 20 lb. resin and mixing it with 90 lb. linseed oil, the resin being used for economy's sake.

6. For some purposes a drying oil may be used with the whiting; this is made by mixing 1 gal. linseed oil, 12 oz. litharge, 1 oz. sugar of lead, 1 oz. white vitriol; simmer for some time, allow to cool, and when settled draw it off.

French Putty.—1. Ruban prepares this substance by boiling linseed oil 7 parts with brown umber 4 parts, for two hours; 5½ parts of chalk and 11 parts of white lead then added, and the whole well mixed. This putty is very durable, and adheres well to wood, even though not previously painted.

2. Gum arabic 1 part, water 2 parts, potato starch 4 parts

Facing Putty.—Mix whiting, some white lead, and a small quantity of litharge. Then add a small quantity of drying oil. This putty is especially good for stopping small flaws.

Indestructible Putty.—Boil 4 lb. brown umber in 7 lb. of linseed oil for two hours; stir in 2 oz. of wax; take from the fire and mix in 5½ lb. of chalk and 11 lb. of white lead and incorporate thoroughly. The latter operation is quite essential.—*Science Record, 1874.*

Imperishable Putty.—Boil together for two hours 3½ lb. linseed oil and 2 lb. brown umber. Then stir in 1 oz. of beeswax. Take off the fire and mix in 2¾ lb. of chalk; 5½ lb. white lead.

Iron Putty.—The iron putty used for steam joints is made by mixing dry 2 parts of a good metallic paint, 1 part litharge, 3 parts fine iron borings sifted, or for close joints, iron filings. Add boiled linseed oil and mix to the consistence of stiff putty.

Lime Putty, for Wood.—Rye flour, 10 parts; slaked lime, 5 parts; linseed oil varnish, 5 parts; umber, q. s. to color.

Wood and Glue Putty.—Dissolve glue in water, and add as much very fine sawdust as is required.

Putty for Floors.—Litharge, 1 part; plaster of Paris, 2 parts; glue, 1 part; water, 8 parts; cement, 4 parts; sawdust, 2 parts; casein, 5 parts; water, 30 parts; ammonia, 3 parts; burned lime, 3 parts.

To Soften Hard Putty.—1. It is well known that common putty becomes exceedingly hard with age, which renders the removal of glass from sashes peculiarly difficult. A practical man tells us that he thinks himself lucky if he can take out one pane out of three without breakage. It is stated, however, that the putty may be softened by using a paste of caustic potassa, easily prepared by mixing the caustic alkali, or even carbonate of potash or soda, with equal parts of freshly burnt quicklime, which has previously been sprinkled with water, so as to cause it to fall into powder. This is then mixed with water to a paste, and is spread on the putty to be softened. Where one application is not sufficient it is repeated. In order to prevent the paste from drying too quickly, it is well to mix it with less water, adding some soft soap instead.

2. Take 1 lb. of pearlash, 3 lb. of quicklime; slake the lime in water, then add the pearlash, and make the whole the consistency of paint. Apply it to both sides of the glass and let it remain twelve hours, when the putty will be so softened that the glass may be removed with ease.

Soft soap rubbed on pretty thick, and allowed to stand about twelve hours or more, will soften putty so that it can be cut out quite easily with a knife.

Putty for Stoves.—See also Stoves. 5 parts clay, 2 parts fine iron filings, 1 part peroxide

of manganese, ½ part salt, ½ part borax; pulverize and mix thoroughly in a mortar. Make into a thick putty with water and use immediately. Will set and harden with heat of the stove.

Wax Putty.—For leaky casks, bungs, etc. Yellow wax, 4 lb.; tallow, 2 lb.; spirits of turpentine, 1 lb.; solid turpentine, 6 lb. Melt the wax and solid turpentine over a gentle fire; add the tallow. When melted take entirely away from the fire, add the spirits of turpentine, let it cool.

Pozzuolana Cement.—A kind of earth thrown out of a volcanoes, of a rough, dusty, granular texture; its most important property consists in making a cement when mixed with ½ its weight of lime and water, which hardens very suddenly, and is more durable under water than any other. Manganese is found to be a valuable ingredient in water cements. 4 parts of gray clay are to be mixed with 6 parts of the black oxide of manganese, and about 90 of good limestone, reduced to fine powder, the whole to be calcined to expel the carbonic acid; when well calcined and cooled, to be worked into the consistence of a stiff paste, with 60 parts of washed sand.

Quicklime Cement.—Dilute white of egg with its bulk of water and beat up thoroughly. Mix to the consistence of thin paste with powdered quicklime. Must be used immediately.

Red Cement.—The red cement used for uniting glass to metals is made by melting 5 parts black resin with 1 part yellow wax, and then stirring in gradually 1 part red ocher or Venetian red, in fine powder, and previously well dried. This cement requires to be melted before use, and it adheres better if the objects to which it is applied are warmed.

Red Lead made into a paste with boiled linseed oil is also used for cementing the joints of metal pipes.

Resinous Cements are excellent in all cases where heat is not applied, and they are very inexpensive.

Retorts, Lute for.—1. Lemery, the chemist, used the following lute for stopping retorts, etc.: Fine flour and fine lime, of each 1 ounce; potter's earth, ½ ounce; make a moist paste of these with white of egg, well beaten up with a little water, and this will be found to stop exceedingly close.

2. This cement is used also in melting pots. Sift brick dust and mix with equal quantity red lead, rub together with boiled linseed oil, which is mixed with coarse sand to the stiffness of cement. In covering dishes apply the paste, then sand. Heat for a long time.

3. Rub freshly slaked lime into a concentrated solution of borax. Apply with a stiff brush, allow it to dry. When heated, the glazing fuses.

4. For large pots take 6 parts litharge; 4 parts fresh burnt pulverized lime; 2 parts white bole and mix with cold linseed oil.

Rice Cement.—Rice cement, which is made by mixing rice flour intimately with cold water and then gently boiling it, forms a beautifully white preparation, and dries nearly transparent; it is capable of bearing a very high polish, and is very durable; it is in every respect far before the common paste made with wheat flour or starch; it may be formed, also, into a plastic clay.

Roadway Cement.—The first coat should be three and a half inches thick, 7 parts of sharp, coarse sand or fine gravel, to 1 part cement, thoroughly mixed in a box dry, then dampened with water. Spread it on the ground in sections or squares. As soon as it is set, put on another coat, 1 inch thick, of 1 part cement to 3 parts sharp sand. When that is set, for a finishing coat put half an inch thick of 1 part cement and 1 part sand. Do not drive over it for five days.

Roman Cement.—This consists of pulvis Puteolanus or pozzuolana, a ferruginous clay from Puteoli, calcined by the fires of Vesuvius, lime and sand, mixed up with soft water. The only preparation which the pozzuolana undergoes is that of pounding and sifting; but the ingredients are occasionally mixed up with bullock's blood and fat of animals, to give the composition more tenacity.

Roman Cement.—Ordinary clay, 60 lb.; calcine and mix with 40 lb. lime; recalcine the whole.

Roofs, Cement for.—1. Melt together in an iron pot two parts by weight of common pitch and one part gutta percha. This forms a homogeneous fluid much more manageable than gutta percha alone. To repair gutters, roofs or other surfaces, carefully clean out of the cracks all earthy matters, slightly warm the edges with a plumber's soldering iron, then pour the cement in a fluid state upon the cracks while hot, finishing up by going over the cement with a moderately hot iron, so as to make a good connection and a smooth joint. The above will repair zinc, lead or iron, and is a good cement for aquariums.

2. Take 4 lb. rosin, 1 pt. linseed oil, 2 oz. red lead, stir in fine sand until the proper consistency is secured, and apply warm. This cement becomes hard, and yet possesses considerable elasticity, is durable and waterproof.

Rubber Cements.—Rubber cements are very common and very useful, but great care should be taken in their preparation to guard against fire; they should not be prepared at night, as the carbon bisulphide, naphtha, or chloroform is very inflammable. Vessels which are used to digest the rubber should be closed and if possible put out of doors. If heat is required, use a sand or hot water bath; on no account bring near a fire.

See also *Gutta Percha Cements.*

Rubber Cement.—1. Digest caoutchouc, cut in fine shreds, with about 4 volumes of naphtha or carbon bisulphide in a well covered vessel for several days.

2. Cement for sticking on leather patches and for attaching rubber soles to boots and shoes is prepared from virgin or native India rubber, by cutting it into small pieces or else shredding it up; a bottle is filled with this to about one-tenth of its capacity, benzine is then poured on till about three parts full, but be certain that the benzine is free from oil. It is then kept till thoroughly dissolved and of a thick consistency. If it turns out too thick or thin, suitable quantities must be added of either material to make as required.

3. Cement used for repairing holes in rubber boots and shoes is made of the following solution: 1. Caoutchouc, 10 parts; chloroform, 280 parts. This is simply prepared by allowing the caoutchouc to dissolve in the chloroform. 2. Caoutchouc, 10 parts; resin, 4 parts; gum turpentine, 40 parts. For this solution the caoutchouc is shaved into small pieces and melted up with the resin, the turpentine is then added, and all is then dissolved in the oil of turpentine. The two solutions are then mixed together to repair the shoe with this cement. First wash the hole over with it, then a piece of linen dipped in it is placed over it; as soon as the linen adheres to the sole, the cement is then applied as thickly as required.

4. Good rubber cement for sheet rubber, or for attaching rubber material of any description or shape to metal, may be made by softening and dissolving shellac in ten times its weight of water of ammonia. A transparent mass is thus obtained, which, after keeping three or four weeks, becomes liquid, and may be used without requiring heat. When applied it will be found to soften the rubber, but when the ammonia is evaporated it forms a kind of hard coat, and causes it to become both impervious to gases as well as liquids.

5. A cement for uniting India rubber is composed as follows: 100 parts of finely chopped rubber, 15 parts of resin, 10 parts of shellac; these are dissolved in bisulphide of carbon.

6. Another India rubber cement is made of: 15 grains of India rubber, 2 oz. of chloroform, 4 drm. of mastic; first mix the India rubber and chloroform together, and when dissolved, the mastic is added in powder. It is then allowed to stand for a week or two before using.

7. Rubber Cement to Mend Boots.—Dissolve 1 drm. of gutta percha in 1 oz. of bisulphide of carbon, filter through coarse filter paper, add 15 gr. of pure rubber, rub the whole smooth with a palette knife, taking care to do it quickly. If necessary, thin with bisulphide of carbon. Keep it away from fire or light, as it is volatile and inflammable.

Rubber, Hard, to Cement.—Dissolve bleached gutta percha in carbon bisulphide. Cement, and when dry brush over carbon bisulphide in which sulphur has been dissolved.

Rubber, Cement to Mend.—Equal parts of pitch and gutta percha are melted together and linseed oil is added, which contains litharge. Melt until all are well mixed, use no more of the linseed oil than necessary. Apply warm.

Rubber Shoes, Cement for.—2½ parts India rubber are dissolved in 70 parts of chloroform by mastication. For the second solution melt 2½ parts India rubber with 1 part of resin, ½ part of Venice turpentine is added, and lastly 10 parts oil of turpentine. Mix the solutions.

To Fasten Hard Rubber to Metal.—Make a thin solution of glue, and gradually add pulverized wood ashes till you have a stiff varnish. Use this cement hot.

Rubber (Hard) Cement for Mending.—1. Fuse together equal parts of gutta percha and genuine asphaltum; apply hot to the joint, closing the latter immediately with pressure. See *Ammonia and Shellac Cement.* No. 4 above.

Oil and Sulphur.—1 of sulphur to 12 of oil gives a substance like molasses; 4 to 12 of oil a stiff substance like rubber. To be successful in making this compound, take an iron ladle, such as is used for the melting of lead, and fill it not more than ⅓ full, and place it over a clear fire. Owing to a quantity of water being held in the oil by the vegetable matter, it will begin to seethe, and, if not closely watched, boil over into the fire. After a little time it will subside, the surface remaining quite placid, with now and then little flickers of smoke flitting across the surface. Your sulphur must be either roll brimstone or the crude sublimed, *i. e.*, not washed or treated with acid. If the first, finely powder it, and mix by degrees in the oil, stirring all the time until incorporated.

Rubber to Wood and Metal, Cement to Fasten.—As rubber plates and rings are now almost exclusively used for making connections between steam and other pipes and apparatus, much annoyance is often experienced by the impossibility or imperfectness of an air-tight connection. This is obviated entirely by employing a cement which fastens equally well to the rubber and to the metal or wood. Such cement is prepared by a solution of shellac in ammonia. This is best made by soaking pulverized gum shellac in 10 times its weight of strong ammonia, when a slimy mass is obtained, which, in three or four weeks, will become liquid without the use of hot water. This softens the rubber, and becomes, after volatilization of the ammonia, hard and impermeable to gases and fluids.

Rust Cement.—Rust Cements for Water and Steam Pipes, Steam Boilers, etc.—1. Make a stiff paste with 2 parts sal ammoniac, 35 parts iron borings, 1 part sulphur and water, and drive it into the joint with a chisel; or, to 2 parts of sal ammoniac and 1 part flowers of sulphur, add 60 parts of iron chips, and mix the whole with water, to which ½ part vinegar or a little sulphuric acid is added. Another cement is made by mixing 100 parts of bright iron filings or fine chips or borings with 1 part powdered sal ammoniac, and moistening with urine; when thus prepared, force it into the joint. It will prove serviceable under the action of fire.

2. Iron may be cemented in wood by dropping in the recess prepared in the latter, a small quantity of a strong solution of sal ammoniac. This causes the iron to rust, rendering it very difficult to extract. Additional rust cements will be found under *Steam Cements* below and also under *Iron.*

Sandstone, Cement for.—Clean sand, 10 parts; lead oxide, 1 part; ground lime, ½ part. Mix with linseed oil.

Scheibler's Cement.—Melt 1 part of wax and 2 parts of shellac, and work into the mixture while still warm 2 parts of gutta percha cut fine.

Schöttler's Cement.—Plaster of Paris (freshly ground), 12 parts, by weight; cinders (sifted), 8 parts; brick dust, 6 parts. Mix with water.

Seal Engravers'.—Common resin and brick dust melted together. Use To fix the pieces of metal while cutting, and also to secure seals and tools in their handles. It grows harder and improves every time it is melted.

Serbat's Linseed Oil Mastic.—Lead sulphate, 6 parts; mix with 1 part linseed; add gradually; add 6 parts powdered pyrolusite.

Shellac.—1. Simple shellac, made into sticks of the size of a lead pencil, is commonly sold for a cement withstanding water, acids, oils, etc. The objects to be cemented are first warmed till they melt the shellac brought in contact with them. This is very good to cement broken glass, porcelain, etc., especially as the objects are again ready for use immediately when cold; but it is not adapted for flexible objects, as it cracks, and also will not withstand heat or alcohol.

2. When the gum called shellac is dissolved in alcohol or naphtha, a cement for uniting broken glass, china, or stoneware is obtained.

Shells, Cement for. See *Paris Cement.*

Shoemaker's Cement.—Dissolve gutta percha in chloroform to the consistency of honey. Heat the surfaces to which it is to be applied, and press together. See also gutta percha and rubber cements above.

Siemens' Cement.—12 lb. black iron rust or iron filings, 100 lb. sulphur.

Signs, Filling, Cement for.—Melt together in a clean iron pot 2 parts each of best asphaltum and gutta percha; stir well together, and then add 1 part of gum shellac in fine powder. It may be used hot and mixed with smalt, vermilion or other pigment, if desired.

Singer's Cement for Electrical Machines and Galvanic Troughs.—1. Melt together 5 lb. resin and 1 lb. beeswax, and stir in 1 lb. red ocher, highly dried and still warm, with 4 oz. plaster of Paris, continuing the heat a little above 212°, and stirring constantly till all frothing ceases; very useful in electroplating and electrotyping. The following cement is especially adapted for troughs.

2. Resin, 6 lb.; dried red ocher, 1 lb.; calcined plaster of Paris, ½ lb.; linseed oil, ¼ lb. Used to cement the plates in voltaic troughs, to join chemical vessels.

Slag Cement.—1. Granulated slag is ground and mixed with lime and the mixture calcined and reground.

2. Blast furnace slag is mixed in the following proportions with lime and clay: Slag, 10 parts; lime, 25 parts; clay, 10 parts. Calcine.

Sodium Silicate Cement. See *Soluble Glass Cement* below.

Soft Cement.—Melt yellow beeswax with its weight of turpentine and color with finely powdered Venetian red. When cold it has the hardness of soap, but is easily softened and moulded with the fingers, and for sticking things together temporarily it is invaluable.

Soluble Glass Cements.—When finely pulverized chalk is stirred into a solution of soluble glass of 30° B. until the mixture is fine and plastic, a cement is obtained which will harden in between six and eight hours, possessing an extraordinary durability, and alike applicable for domestic and industrial purposes. If any of

the following substances be employed besides chalk, differently colored cements of the same general character are obtained:

1. Finely pulverized or levigated stibnite (gray antimony or black sulphide of antimony) will produce a dark cement, which, after long burnishing with an agate, will present a metallic appearance.

2. Pulverized cast iron, a gray cement.

3. Zinc dust, so-called zinc gray, an exceedingly hard gray cement, which, after burnishing, will exhibit the white and brilliant appearance of metallic zinc. This cement may be employed with advantage in mending ornaments and vessels of zinc, sticking alike well to metals, stone and wood.

4. Carbonate of copper, a bright green cement.

5. Sesquioxide of chromium, a dark green cement.

6. Thenard's blue (cobalt blue), a blue cement.

7. Minium, an orange colored cement.

8. Vermilion, a splendid red cement.

9. Carbon red, a violet cement.

Water Glass and Lime Cement.—Solution of water glass, 20 parts; quicklime, 8 parts; whiting, 80 parts. Used for flag pavement by mixing with small sharp edged stones and stamping in moulds. Hardens slowly.

Water Glass Cement with Zinc and Pyrolusite.—Water glass, 16 parts; pyrolusite, 64 parts; zinc white, 80 parts. Used for cementing the joints of pipes exposed to red heat. Hardens quickly and makes a close joint.

Water Glass, Cement for, Porcelain and Glass.—Solution of water glass, 48 parts; elutriated glass powder, 8 parts; elutriated powder of fluorspar, 16 parts. Stir together quickly. The paste which is formed should be applied at once. This cement hardens in a few days, so that the article can be heated with safety.

Sorel's Cement.—Mix commercial zinc white with half its bulk of fine sand, adding a solution of chloride of zinc of 1·26 specific gravity, and rub the whole thoroughly together in a mortar. The mixture must be applied at once, as it hardens very quickly. See also *Zinc*, below.

Steam Boiler Cement.—1. Mix 2 parts of finely powdered litharge with 1 part of very fine sand and 1 part of quicklime which has been allowed to slake spontaneously by exposure to the air. This mixture may be kept for any length of time without injuring. In using it a portion is mixed into paste with linseed oil, or, still better, boiled linseed oil. In this state it must be quickly applied, as it soon becomes hard.

2. Dried and powdered clay, 6 lb.; iron filings, 1 lb.; made into a paste with boiled linseed oil; used for stopping cracks and leaks in boilers, stoves, etc.

3. Litharge in fine powder, 2 parts; very fine sand, 1 part; lime that has been allowed to slake spontaneously in a damp place, 1; mixed, and kept from the air; made into a paste with boiled oil, and used to mend cracks and secure steam joints.

4. Good linseed oil varnish ground with equal weights of white lead, oxide of manganese, and pipe clay.

5. Dry, powdered clay, 1 part; clean, sifted iron filings, 2 parts; acetic acid, sufficient to make a paste.

6. Dry, powdered clay, 8 to 10 parts; iron filings, free from rust, 4 parts; peroxide of manganese, 2 parts; sea salt, 1 part; borax, 1 part; water, sufficient to make a paste.

7. Sulphate of baryta, 1 part; clay, 2 parts; made up with solutions of silicate of potash and borax; it resists a very high temperature.

8. Iron filings, free from rust, 50 parts; flowers of sulphur, 2 parts; pulverized hydrochlorate of ammonia, 1 part; these substances are mixed with water or urine, so as to make a solid and homogeneous paste, which is used in the joints of steam boilers. The lute swells, becomes very solid, and perfectly closes the joints.

9. Iron filings, 4 parts; loam, 2 parts; powdered sandstone, 1 part; made into a paste with salt water; becomes very hard on setting.

10. A thick paste, composed of silicate of soda and iron filings; the latter substance may be replaced by a mixture, in equal parts, of powdered oxide of zinc and peroxide of manganese.

11. Sand, 84 parts; Portland stone, 166 parts; litharge, 18 parts; pulverized glass, 0·90 part; red lead, 0·45 part; suboxide of lead, 0·90 part; the whole rubbed up with oil.

12. Cement to stop steam leak: Iron borings, powdered fine, 1 lb.; sal ammoniac in powder, 2 oz.; flowers of sulphur, 1 oz.; mix the whole thoroughly dry. For use mix 1 part of the above with 20 parts of fine iron borings, and mix with water until of the consistence of mortar. Use at once.

Stephenson's Oil Cement.—1. Litharge, 10 parts; air slaked lime, 5 parts; fine sand, 5 parts; mix to a paste wth hot linseed oil. Use immediately.

2. Litharge, 20 parts; slaked lime, 10 parts; sand, 10 parts; linseed oil varnish, 3 parts.

Stickall.—This is simply a solution of potassium silicate. It forms a very valuable cement for mending statuary. It suffices to brush the surfaces with the solution, and to press them firmly together.

Stieda's White Zinc Cement.—Rub up oxide of zinc with turpentine, and add, stirring continually for every drachm of zinc oxide, 1 oz. of a solution of dammar in turpentine, of the consistency of thick sirup. This gives a white cement like Ziegler's. For a red cement, take, instead of zinc, cinnabar, and take 2 drm. of the metal for each ounce of the dammar solution. If the cement has become too thick with age, dilute with turpentine, ether, or chloroform.

Stone. See also *Metallic Cements.*

Stone Cement.—River sand, 20 parts; litharge, 2 parts; quicklime, 1 part; linseed oil to mix.

Stone Sidewalks, Artificial, Cement for.—English Portland cement is generally preferred. Procure a sharp, light-colored sand, and wash it free from all particles of soft earth or soil; also some stone chips, gravel, and large stone. Excavate the sidewalk about 18 in. deep, and fill in the large stone to within 6 in. of the surface; prepare a concrete made of the cement 1 part, stone chips and gravel about 6 parts, and bed it in upon the stone bottom to within 2 in. of the surface; then prepare a concrete of the cement 1 part and fine sand 2 parts, and lay it in up to the surface, floating the surface with the cement at pleasure. Finish by lining off into very regular blocks. A more economical sidewalk can be made by omitting the stone bed, but it will require a good hard soil to lay it on, and then will not be so sure of being permanent.

Stonemason's Cement.—Clean river sand, 20 lb.; litharge, 2 lb.; quicklime, 1 lb.; linseed oil, sufficient to form a thick paste. This cement is applied to mend broken pieces of stone, and after a time it becomes exceedingly hard and strong.

Stove Cement, for the Joints of Iron Stoves.—Mica, together with finely sifted wood ashes, an equal quantity of finely powdered clay, and a little salt. When required for use, add enough water to make a stiff paste.

Cement for Closing Cracks in Stoves.—1. This cement is prepared by mixing finely pulverized iron, such as can be procured at the druggists', with liquid water glass to a thick paste, and then coating the cracks with it. The hotter the fire then becomes the more does the cement melt and combine with its metallic ingredients, and the more completely will the crack become closed.

2. Take equal parts of sulphur and white lead, with about ¼ part of borax; incorporate them so as to form one homogeneous mass. When going to apply it, wet it with strong sulphuric acid and place a thin layer of it between the two

pieces of iron, which should then be pressed together. An excellent cement consists of glycerine and litharge stirred to a paste.

3. Sand, 6 parts; iron filings, 5 parts; bone black, 5 parts; slaked lime, 6 parts; glue water, q. s. See also *Iron Cements* and *Putty*.

Stratena.—This well-known household cement is said to be prepared as follows: 6 parts white glue are dissolved in 8 parts acetic acid; this solution is added to another composed of 1 part French gelatine in 8 parts water. After mixing add 1 part shellac varnish.

Sulphur or Brimstone Cement.—Roll sulphur is frequently used alone as a cement for fastening iron bars in holes drilled in stone. The addition of brick dust, sand or resin lessens its liability to crack. When the yellow color of brimstone is an objection, a little graphite may be mixed with it.

Tapes, Insulating. See *Insulating Cements*.

Temporary Cement.—A temporary cement, to fix optical glasses, stones, jewelry, etc., on stocks or handles for the purpose of painting, repairing, or ornamenting, is made by melting together at a good heat, 2 oz. of resin, 1 drm. of wax, and 2 oz. of whitening; with this applied to the article when heated, secure fixation may be obtained, unfixed at pleasure by the same means, viz., heat.

Terra Cotta, Cement for.—Coat the terra cotta after heating and apply the cement as soon as possible. The cement is made as follows: 10 parts rosin, 10 parts yellow wax, 2 parts sulphur. Melt these together and add 1 part each of hammer slag and quartz sand. Point up the edges of the joint with pounded terra cotta.

Tiles, to Stick to Iron.—Use a gutta percha cement, made by melting together in an iron pan 2 parts of common pitch and 1 part of gutta percha. Stir them well together until thoroughly incorporated and then pour the liquid into cold water. When cold it is black, solid and elastic; but it softens with heat, and at 100° F. is a thin fluid. Also try bedding in plaster of Paris.

Cement for Tile Roofs.—Dry sand and whiting equal parts; 25% of litharge. Make of the consisteney of putty, with linseed oil. This cement is not liable to crack when cold, or melt like tar or asphalt with the heat of the sun.

Tolu Balsam Cement.—Tolu balsam, 2 parts; Canada balsam, 1 part; saturated solution of shellac in chloroform, 2 parts. Add enough chloroform to bring the mixture to a sirupy consistence. Carnoy finds this cement superior to all others. Used by microscopists.

Teeth, Cements for the.—Tooth cements are extensively used in England, but their use is not advised. Consult a good dentist. See also *Sorel's Cement*.

Phosphate Cement.—1. Concentrate pure phosphoric acid till semi-solid; mix aluminum phosphate with it by heating. For use, mix with basic oxide of zinc to the consistency of putty. The light oxide of zinc should not be used here, nor in making oxychlorides. The cement sets in two minutes.

2. "By calcining magnesium nitrate an oxide is made. This, when hydrated, forms a durable cement. When mixed with phosphoric acid it hardens at once, growing so hot as to burn the hand. As basic oxide of zinc forms with phosphoric acid a slower-setting cement, the indication is plain. I have used for pulp capping and temporary filling the following mixture: Basic oxide of zinc, 2 parts; oxide of magnesium, 5 parts. Grind them together. For use, mix to a paste with sirupy phosphoric acid. This sets in thirty seconds."

3. Gutta Percha Stopping.—This is pure, uncolored, native gutta percha. A small piece is softened in hot water, and at once applied. It answers well for filling hollow teeth with central cavities, and is efficient and durable.

4. Vienna Cement.—Powdered asbestos made into a paste with thick mastic varnish. Neither hard nor durable.

5. Wirth's Cement.—Levigated quartz made into a paste with very thick mastic varnish. The color is good, but it is not very durable.

6. Mr. Evans'.—Take of pure grain tin, 2 parts; cadmium, 1 part; beeswax, 1 part. Melt them together in a porcelain crucible at a heat not exceeding 600° F., and 'cast' the alloy so as to form a small ingot, which, when cold, must be reduced to filings. For use, a small quantity of these 'filings' is formed into an amalgam with quicksilver, the excess of the latter is squeezed out through a piece of chamois leather, and the amalgam at once applied to the tooth. This cement is recommended by Mr. Evans as very durable and unobjectionable. Its color is intermediate between that of silver and tin, but it is said not to darken so readily as the simple amalgam of those metals.

7. Zinc Amalgam; Dentist's Zinc.—Pure zinc filings, combined with twice their weight of quicksilver, a gentle heat being employed to render the union more complete. It is best applied as soon as made. Color gray, often proves effective and durable.

8. Poudre Métallique.—According to Mr. Redwood, the article sold in Paris under this name is a triple amalgam of mercury, silver and ammonium, with the latter in excess.

9. Silica.—A mixture of levigated porcelain, plaster of Paris, and steel filings, in equal proportion, made into a paste with thick, quick-drying copal varnish. It is only adapted to fill central cavities in the double teeth, as its color unfits it for the front ones.

10. Taveare's.—This is powdered mastic mixed with about ½ its weight of ether, and then with sufficient powdered burnt alum to form a stiff paste. It must be kept in a closely stoppered bottle. It has little hardness and durability.—*Cooley.*

Tortoise Shell, Cement for.—1. Dissolve in 125 parts alcohol 90%, 30 parts of shellac, 10 parts mastic and 2 parts turpentine.

2. Mastic, 15 parts; shellac, 45 parts; turpentine, 3 parts; spirit of wine 90%, 175 parts.

3. Gum mastic, 10 parts; shellac, 30 parts; turpentine, 2 parts; spirits of wine 90%, 120 parts.

Transparent Cement.—1. According to *Dingler's Polytechn. Journal*, a very strong, transparent cement, applicable to wood, porcelain, glass, stone, etc., may be made by rubbing together in a mortar 2 parts of calcium nitrate, 25 parts of water, and 20 parts of powdered gum arabic. The surfaces to be united are to be painted with the cement, and bound together until completely dry.

2. Pure, unvulcanized rubber, 75 parts; dissolve in 60 parts of chloroform, and 15 par of mastic are added.

Trees, Cement for.—The following cemet used to protect injured trees: 2 parts of yel ocher; wood ashes (sifted), 1 part; white l 10 parts; Venice turpentine, 2 parts; linseed oil, q. s. to mix.

Turner's Cement.—1. ½ oz. rosin, ½ oz. pitch, 1 oz. beeswax; melted together, sufficient fine brick dust added to produce desired consistence.

2. 2 lb. rosin, 2 lb. Burgundy pitch, 2 lb. dried whiting, 2 oz. yellow wax, melted and mixed together.

3. ½ lb. black rosin, 1 oz. yellow wax; melted together, and poured into a tin canister.

4. Use a mixture of rosin, turpentine and yellow wax, then add a little pulverized sealing wax.

5. Melt 1 lb. of rosin in a pan over the fire, and, when melted, add ¼ lb. of pitch. While these are boiling add brick dust until, by dropping a little on a cold stone, you think it hard enough. In winter it may be necessary to add a little tallow. By means of this cement a piece of wood may be fastened to the chuck, which will hold when cool; and when the work is finished it may be removed by a smart stroke with

the tool. Any traces of the cement may be removed from the work by means of benzine.

6. When wanted for use, chip off as much as will cover the chuck to the $\frac{1}{16}$ of an inch, spread it over the surface in small pieces, mixing it with ¼ of its bulk of gutta percha in thin slices; then heat an iron to a dull red heat, and hold it over the chuck till the mixture and gutta percha are melted and liquid; stir the cement until it is homogeneous; chuck the work, lay on a weight to enforce contact, leave it at rest twenty minutes.

7. The following is a very excellent cement for the use of turners and artisans in general: 16 parts of whiting are to be finely powdered and heated to redness, to drive off all the water; when cold, this is mixed with 16 parts of black resin and 1 part of beeswax, the latter having been previously melted together, and the whole stirred till of uniform consistence.

Vegetable Cement.—1. Mix gum arabic with calcium nitrate, 1 part of the gum arabic to 10 parts of the calcium, and use 10 parts of water.

2. Calcium nitrate, 2 parts; 20 parts gum arabic (pulverized); 25 parts water.

Venice Cement.—If glue is mixed with ¼ its weight of Venice turpentine, a cement is formed which will unite glass with metals or wood.—*Building News.*

Vulcanite, to Cement.—1. Dissolve 1 part of sulphur and 3 parts pure caoutchouc in 6 parts alcohol and 100 parts bisulphide of carbon, and evaporate to the consistence of a thin paste. Join the fractured edges with this, and heat the whole to about 310° F., for four hours.

2. Mix dry caoutchouc with ½ its weight of flowers of sulphur, and thoroughly knead the mixture on a plate of warm metal. Heat the teeth to a temperature of about 212° F., join the fractured edges with a little of the caoutchouc dough, moistened with a drop or two of bisulphide of carbon, and expose the whole to a temperature of about 200° F. for two hours. At the expiration of this time, raise the temperature to 390°, and maintain it constantly at this for four hours more. When cool, the joint will be found firm, and may be trimmed with a sharp knife.

Wash Basins, Cement for.—Glass meal, 2 parts; litharge (elutriated), 2 parts; linseed oil varnish, 1 part. Wet the powders slightly with the oil, heat and gradually add the rest. Do not use the basin for four days. Glass meal can be made by heating glass and throwing in cold water. Grind and elutriate.

Water Cements.—1. 100 parts slaked lime, 190 parts brick dust, 160 parts sand, 50 parts blacksmith's dross, 50 parts powdered lime; mix with water.

100 parts iron filings, 100 parts ignited sand, parts powdered slaked lime; mix with water.

Waterproof Cements.—1. Soak pure glue in water until it is soft, then dissolve it in the smallest possible amount of proof spirits by the aid of gentle heat. In 2 oz. of this mixture dissolve 10 gr. of gum ammoniacum, and, while still liquid, add ½ dr. of mastic dissolved in 3 dr. of rectified spirits. Stir well, and for use keep the cement liquefied in a covered vessel over a hot water bath.

2. A good waterproof cement may be made by mixing glue 5, rosin 4, red ocher 3 parts, with a little water.

3. Shellac, 4 oz.; borax, 1 oz.; boil in a little water until dissolved, and concentrate by heat to a paste.

4. 10 parts of carbon disulphide and 1 part of oil of turpentine are mixed, and as much gutta percha is added as will readily dissolve.

5. Tar, 1 part; tallow, 1 part; fine brick dust, 1 part; the latter is warmed over a very gentle fire; the tallow is added, then the brick dust, and the whole is thoroughly mixed. It must be applied while hot.

6. Good gray clay, 4 parts; black oxide of manganese, 6 parts; limestone, reduced to powder by sprinkling it with water, 90 parts; mixed, calcined, and powdered.

7. Manganese iron ore, 15 parts; lime, 85 parts; calcined and powdered.

Both six and seven require to be mixed with a little sand for use; thrown into water they harden rapidly.

8. Fine, clean sand, 1 cwt.; powdered quicklime, 28 lb.; bone ash, 14 lb. Beaten up with water for use.

9. Quicklime, 5 parts; fresh cheese, 6 parts; water, 1 part. The lime is slaked by sprinkling with the water; thereupon it is passed through a sieve, and the fresh cheese is added. The latter is prepared by curdling milk with a little vinegar and removing the whey. The cement thus formed is very strong, but it requires to be applied immediately, as it sets very quickly.

10. Fresh curd, as before, 1 part; quicklime, 1 part; Roman cement, 3 parts. Used for joining stone, metals, wood, etc.

11. A paste composed of hydraulic lime and soluble glass.

12. 1 part glue, 1 part black rosin, ¼ part red ocher, mixed with least possible quantity of water.

13. 4 parts glue; 1 part boiled oil by weight; 1 part oxide of iron.

14. Mix a handful of quicklime with 4 oz. linseed oil, thoroughly lixiviate the mixture, boil it to a good thickness, and spread it on tin plates in the shade. It will become very hard, but it can be dissolved over a fire, like common glue, and is then fit for use.

Yates' Waterproof (Old).—Glue, 4 oz.; isinglass, 2 oz. Dissolve in ale over a slow fire, then add 1½ oz. boiled linseed oil. When required for use dissolve in ale. [This cement is from Mackenzie, and was once a great favorite.—ED.]

White Cement.—Mix in a well-stoppered bottle 10 drm. chloroform with 12½ drm. unvulcanized caoutchouc in small pieces. The solution is easily effected, and, when finished, add 2½ drm. mastic, and let the whole macerate from eight to ten days, shaking the mixture from time to time, but without heat. A perfectly white and very adhesive cement is thus produced. This compound is made on the same principle as the cement greatly in vogue among florists for making permanent bouquets.

White Lead Cement, Withstanding Heat and Moisture.—Pure white lead, or zinc white, ground in oil, and used very thick, is an excellent cement for mending broken crockery ware, but it takes a very long time to harden. It is well to put the mended object in some store room, and not to look after it for several weeks, or even months. It will then be found so firmly united that, if ever again broken, it will not part on the line of the former fracture.

Wollaston's White Cement for Large Objects.—Beeswax, 1 oz.; rosin, 4 oz.; powdered plaster of Paris, 5 oz. Melt together. To use, warm the edges of the specimen and use the cement warm.

White Cement, Zeigler's.—Composition unknown. Is very much used on the Continent for microscopical use.

Wood, Resinous Cement for Coating.—This cement is fairly acid proof and resists alkalies. Melt 3 parts rosin, 1 part asphaltum and 2 parts brick dust. Use hot.

Wood, Cement to Stop Flaws or Cracks in.—1. Put any quantity of fine sawdust of the same kind of wood into an earthen pan, and pour boiling water on it; stir it well, and let it remain for a week or ten days, occasionally stirring it; then boil it for some time, and it will be of the consistence of pulp or paste; put it into a coarse cloth and squeeze all the moisture from it. Keep for use, and, when wanted, mix a sufficient quantity of thin glue to make it into a paste; rub it well into the cracks, or fill up the holes in your work with it. When quite hard and dry, clean the work off, and, if carefully done, you will scarcely discern the imperfection.

2. Make a paste of slaked lime, 1 part; rye meal, 2 parts; with a sufficient quantity of linseed oil.

3. Dissolve 1 part of best glue in 16 parts of water, and when almost cool stir in sawdust (hardwood) and prepared chalk a sufficient quantity. Oil varnish thickened with a mixture of equal parts of white lead, red lead, litharge and chalk.

4. A Hard Cement for.—The following cement will be as hard as stone when dry, and will adhere firmly to wood. Melt 1 oz. of resin and 1 oz. of pure yellow wax in an iron pan, and thoroughly stir in 1 oz. of Venetian red, until a perfect mixture is formed. Use while hot. When cold it is as hard as stone.

5. Oil Cement for.—1 part pulverized slaked lime; 2 parts rye flour; mixed with linseed oil varnish. It takes any desired color and polish.

Wood to Metals.—A good cement. An excellent cement for uniting articles of wood with metals, glass, stone, etc., may be obtained by dissolving glue in boiling water and making it of the same consistence as that of cabinet-makers' glue; then add, while stirring, a sufficient quantity of wood ashes as to produce a varnish-like mixture. While hot, the surfaces to be united must be covered or coated with this glue compound, and pressed together. When cold the surfaces will be found firmly united, and much force will be needed to separate them again.

Wood to Stone, Cement for Fastening.—Melt together 4 parts pitch and 1 part wax, and add 4 parts brick dust or chalk. It is to be warmed, for use, and applied thinly to the surfaces to be joined.

Zeiodite.—Is a cement composed of 10 parts sulphur and 12 parts glue or pumice.

Zinc Cement.—Used by microscopists. Dissolve 1 oz. gum dammar in 1 oz. of oil of turpentine by the aid of heat; rub up 1 drm. zinc oxide with an equal quantity of oil of turpentine (adding the latter drop by drop) into a creamy mixture perfectly free from lumps or grit; and then mix the two fluids, which must be stirred well together, and strained through fine muslin wetted with turpentine. Blue or a green pigments may be worked up with this if desired.

Zinc White Cement.—German formula: 1, mastic; 2, dammar; 3, sandarac; 4, Venetian turpentine; 5, turpentine; 6, benzol; 7, zinc white. 1, 2, and 3, powdered, are mixed in a well-corked bottle with 4, 5 and 6; shake well occasionally; after several days filter, and triturate in a mortar with zinc white in quantity sufficient. Dilute if necessary with benzol.

Zinc White.—English formula: 1, gum dammar; 2, gum mastic; 3, benzol. Dissolve powdered 1, 2 and 3 in a well-corked bottle; when dissolved, filter and mix carefully in a mortar with zinc white.

Zinc Ornaments, Cement for.—Water glass having fine whiting and impure zinc (zinc gray) stirred in forms an excellent cement and receives a high polish.

Zinc Cement, Oxychloride of.—1. This cement or mastic is prepared by mixing 1 part of the finest pulverized glass with 3 parts of oxide of zinc thoroughly calcined (made from the carbonate), which is afterward kept in well stoppered glass vials. Separately 1 part of borax is dissolved in the smallest possible quantity of water. It is mixed with a solution of chloride of zinc of 1·5-1·6 sp. gr., and is kept in this state in well closed vials. To use this mastic, enough of the powder is mixed with some of the liquid to form a putty, which hardens readily until like stone. Under the name of Paris dental cement a similar preparation is sold in the pharmacies which has even been used for filling hollow teeth. This composition can serve excellently for many other purposes; for example, to attach to each other different parts of technical, scientific, or domestic appliances, where a tenacious, quickly hardening cement is required.—*L'Elettricita.* See also *Teeth.*

2. That in most general use for ordinary plugging is composed of oxide of zinc, 5; silex, 2; borax, 1; moistened with a solution of 1 oz. zinc chloride in 6 drm. water. Where it is to be used as a capping or temporary filling over freshly exposed pulps the fluid should be zinc chloride, 1 oz.; water, 1 to 2 oz.; making a solution of only sufficient strength to cause the mixture to set. The cavity having been cleaned, creosote should be applied to the exposed pulp, and the oxychloride introduced in a semi-fluid state, and protected by a rubber dam from the fluids of the mouth until properly hardened (half an hour usually suffices). It is advisable to allow several days to intervene for the more thorough solidification of the cap prior to the removal of the excess of material and final insertion of the metal stopping.

Cerates, Ointments and Salves.—These are unctuous substances, composed mainly of oil or lard mixed with wax, spermaceti or resin in different proportions. Cerates are used principally for a dressing or kind of plaster, and are of firmer consistency. Ointments are mainly intended to be rubbed upon the surface, and ordinarily melt or become soft at the temperature of the body. The cerates contain a greater amount of wax, from which (*cera*, wax) they derive their name. The tendency of this class of preparations to become rancid may be largely obviated by dissolving in them a little gum benzoin or benzoic acid. Ointments made with the fixed oils, with suitable proportions of wax, suet or cocoa butter, are less liable to rancidity than those made with lard.

Vaseline, Simple Cerate.—Vaseline, 16 oz.; white wax, 8 oz. Melt with a gentle heat. This cerate keeps well, is of medium consistency, and can be used all the year round, not being too hard for cold or too soft for warm weather.

Resin Cerate.—Vaseline, 16 oz.; yellow wax, 4 oz.; resin, 10 oz. Melt as resin cerate, U. S. P. This offers no advantage over lard cerate, and requires constant stirring on cooling, as the resin tends to separate readily.

Pomatum Camphoratum.—This is a strong solution of camphor in lard and wax. With vaseline it is inalterable. The formula is as follows: Camphor, 6 dr.; white wax, 6 dr.; vaseline, 14 dr.

Simple Cerate.—White wax, ¼ lb.; sweet oil, ½ lb.; water, 3 oz.; melt and stir until cold.

Cerise.—A coal tar color, of the rosaniline group, obtained from magenta residues. It is much used in compound colors.

Ceromel.—Van Mons. Beeswax, 1 oz.; honey 4 oz.; melt together and stir until cold. An excellent application to irritable ulcers, abraded surfaces, sore nipples, etc.

Cetine.—Syn. Pure Spermaceti. Dissolve spermaceti in boiling alcohol, and collect the crystals that deposit on cooling. Prep. Bright pearly crystals; melts at 120°; sublimes at 670°.

Chalk.—*Camphorated.*—Camphor, 1 oz.; precipitated chalk, 15 oz. Prepared chalk may be used in lieu of precipitated chalk. Less white and velvety, but cleans the teeth better than the softer article.

Colored Chalk for Tailors' Use.—Knead together ordinary pipe clay, moistened, and ultramarine for blue, finely ground ocher for yellow, burnt ocher for red, etc., until they are uniformly mixed; roll out into thin sheets, cut, and press into wooden or metallic moulds well oiled to prevent sticking, and allow to dry slowly at ordinary temperature, or at a very gentle heat.

Precipitated Chalk.—This is prepared by adding a solution of carbonate of soda to a solution of chloride of calcium (both cold), as long as a precipitate forms. This last is well washed with pure water, and dried out of the dust, as the last. The refuse, "sulphate of

lime" of the soda water makers, which is poisonous in quantity, is often sold for it by the druggists. Pure chalk is wholly soluble in vinegar, and in dilute acetic, hydrochloric, and nitric acid, with effervescence. Sulphate of lime is insoluble in these menstrua.

Prepared Chalk.—Syn. Creta. Rub 1 lb. chalk with sufficient water, added gradually, until reduced to a very fine powder; then put this into a large vessel with water, agitate well, and, after a short interval, pour off the supernatant water, still turbid, into another vessel, and let the suspended powder subside. In the same way shells are prepared, after being first freed from impurities, and washed with boiling water.

Chameleon Pictures.—Put into small bottles, say 2 drachm, some bromide of copper, chloride of cobalt, and acetate of cobalt in solution. Label distinctly.

Directions.—Draw a scene on paper with bromide of copper. The trees stretching across the sky, and the snow-covered ground, may be changed to vernal beauty by heat. This is done by painting in the grass, foliage, etc., in muriate of cobalt, and the blues—of the sky and water—in acetate of cobalt. These tints will be invisible until held before the fire.

Champagne. See **Wines** and **Cider.**

Chaps.—The effect of cold is to diminish the caliber of the cutaneous blood vessels by producing contraction of their coats. Hence there is a lessened supply of blood to the skin and a lessened nutrition, accompanied by a decreased secretion of the cutaneous glands. The deficient secretions must be replaced by an outward application. The following formula will be of service:

1. White wax, 1 part; borax, 3 parts; juice of bitter almonds, 1 part; oatmeal water, 3 parts.

2. Milk, 1 part; chalk, 2 parts; glycerine, 1 part.

3. Spermaceti, 2 parts; white wax, 1 part; glycerine, 1 part; chalk, 3 parts; oatmeal water, 2 parts.

4. Chaptal's Water, for Chapped Breasts.—Sulphate of alumina, 1 drm.; sulphate of zinc, ½ oz.; borate of soda, 4 grn.; rose water, 6 oz.

Cracked Hands.—Various receipts are given for this, as follow. 1. Try the following ointment: Camphor, 60 grn.; boric acid, 30 grn.; lanoline, white vaseline, of each ½ oz.; to make an ointment.

2. Anoint your hands with glycerine after washing and while they are still damp. If used without some water it has a drying tendency. Vaseline is no good.

3. Mix a powdered ball of sal-prunel with 2 oz. of vaseline, and rub well in.

4. Pomatum for Chapped Lips.—The following is from the *Druggists' Circular:* Lard, 16 parts; cacao oil, 24 parts; spermaceti, 8 parts; yellow wax, 3 parts; alcanna root, 1 part. The substances are fused for a quarter of an hour at a gentle heat, then strained through a cloth and mixed with oil of lemon, oil of bergamot, of each ¼ part, oil of bitter almonds ⅛ part, when the mass is poured into suitable vessels to cool.

Chartreuse. See **Liquors.**

Chayavra.—A plant of the madder family, capable of dyeing similar colors. Abundantly used in India, but not met with in European markets.

Cheese, Cheese Coloring.—Roll annatto 1 part, potassium carbonate 1 part; digest 1 day in 10 parts water. Filter, add water if necessary.

Cheese Makers, Notes for.—*Cheese Factories and their Surroundings.*—1. The present, not next week, will be the best time to see that all the drainage facilities of the factory are adequate and in good working order.

2. Whey runs, spouts and tanks should be put into such order that leaking will be prevented.

3. If there be a leakage anywhere from floors, spouts or tanks, which is not immediately preventable, provision should be made at once for the drainage of the waste, if only by shallow open trenches. A liberal supply of lime and gypsum should be spread around such places. Don't fail to secure a barrel or two of each, for use during the hot weather.

4. If the factory buildings are not painted and will not be painted, get them whitewashed at once. If you cannot get that done by the proprietors or managers, get permission and do the rest yourself. A whitewashed curing room of imperfect construction can be kept 10° cooler in summer than one not whitewashed. If the cheese become injured, through excess of heat, neither the buyers nor the patrons will whitewash your reputation then, whether the blame belongs to you or not.

5. Make the surroundings of the factory neat and tidy. Plant a few trees and a great many flowers.

6. While keeping the outside of the premises as creditable to your taste and neat habits as possible, make the inside to reflect still more your aversion to everything untidy and dirty. Give every part of the factory a thorough cleaning and keep it in a sweet state all summer.

7. Before the curing room contains any cheese, fumigate it by burning some sulphur mixed in alcohol. That will help to prevent the growth of mould on the outside of the cheese.

8. The leisure hours of May, before the large flow of milk is received, should be employed putting all the apparatus, appliances, utensils and machinery into the best of working order.

9. Be sure that the making room floor is so well constructed and supported that it will not shake or vibrate during the coagulation of the milk.

Milk and Making.—1. Look out for leeky flavors in the milk. Don't put such milk into the vat with that of the other patrons. If you have time, make it up by itself, and send the cheese from it to the patron who supplied that milk, for his private use.

2. Make provision for keeping a short record of each day's work, of the exceptional treatment of every vat and of the comparative quality of the cheese from each vat, before they are shipped.

3. Milk sours readily and rapidly for a number of weeks after the period of lactation in the cows begins. Hence milk seldom requires to be ripened for setting during May.

4. Use enough rennet to coagulate the curd into a state fit for cutting, in from 17 to 20 minutes, at from 82° to 88° Fah.

5. Cut it rather early, slowly and very carefully.

6. Use the horizontal knife first.

7. Afterward allow the curd to settle until whey comes over nearly the whole surface.

8. Then begin to cut with the perpendicular knife.

9. Immediately after the cutting is completed, begin to stir the mass slowly and continuously, until the curd is cooked.

10. Heat should not be applied until 10 minutes after the stirring is begun.

11. The heating should be effected gradually, at the rate of about 1 degree for every 4 or 5 minutes until 98° Fah. is reached.

12. Draw most of the whey early, and so guard against being caught unprepared for the rapid development of acid.

13. Don't dip the curd until the presence of acid is discernible by the hot iron test. Sweety flavors result from too early dipping in May.

14. After dipping the curd, stir it gently and keep it at a temperature above 94°.

15. Don't attempt close matting, high piling or packing of the curd. See that the whey is separated from it.

16. When it begins to feel "slippy" and smells like fresh-made butter, it should be put through the cutter or grinder.

17. Acid develops so rapidly that care must be taken to keep the treatment well in advance of the change in the curd.

18. After grinding or cutting, stir for 10 or 15 minutes before salting.

19. Apply salt at a rate of about 1¼ lb., early in the month, to 2 lb. per 1,000 lb. of milk during the last ten days, varying the quantity slightly according to the condition of the curd as to its moisture.

20. Begin to put the curd in the hoops within 20 minutes after the salt is stirred in.

21. Use only pure water in bandaging.

22. Guard against the formation of edges or shoulders from the hoop followers being too small. Apply the pressure gradually until the whole power through the long lever is used, after four hours.

23. Leave the press cloths on, and turn the cheese in the hoops every morning. Let no cheese leave the press room until the shape is symmetrical and the finish neat.

24. Don't press the scaleboards on the ends of the cheese.

25 When the press cloths are removed, use hot clean whey oil or butter, into which has been dissolved a teaspoonful of soda per cupful of oil.

26. Try to keep the temperature of the press room above 60° Fah.

27. The curing room should be kept at a temperature continuously between 65° and 70° F.

28. Provide strong, smooth boxes of the exact size.

29. Stencil the weight of the cheese in neat figures on the side of every box.—*Jas. W. Robertson, Dairy Commissioner.*

Cheese Making.—It is quite easy to make cheese on a small scale. The operation is as follows: Place your milk in a tin vessel, and place this in a larger one filled with water, so that in heating it over a fire it cannot burn the milk. The heat required is only 82° Fah., therefore in very hot weather it may be necessary to cool the water outside the vat with ice, so as to cause the milk to attain this temperature. Then the milk is exposed to the action of the so-called "rennet." This is the lining of one of the stomachs of the calf, and possesses strong digestive powers, especially for milk, which it coagulates very rapidly; even an infusion or preparation of this membrane possesses the same property, and is often used instead. The quantity required is best learned by experience; but when using good liquid rennet, the small quanity of ⅛ of 1% is sufficient, or ½ a drachm for every gallon of milk. This liquid rennet is thoroughly stirred into the milk, and left alone for 20 minutes, when the curd is settled. The supernatant liquid, the whey, is then separated and the curd cut up in small pieces; then it is heated for about an hour to 98°, and continually stirred. When thoroughly cooked the remaining whey is separated. As long as the curd sticks together there is whey present, but as soon as it crumbles when pressed in the hand, it is ready to be strained and salted, requiring ¼ of 1% of the milk used, or about 3 drachms of salt for every gallon of milk. The curd is then left to cool, ladled into a galvanized iron hoop, and pressed. After an hour's pressure, the mass, which now looks like a cheese, is taken out, bandaged, replaced under the press, and left there under continual pressure for about 18 hours. Then the cheese is "cured," which consists in dressing it with the skimmings of the whey, coloring the outside with some annatto, and keeping it in a well ventilated room at a temperature of about 60° or 70°, and turning it around every day for a few weeks. As to the question if it will pay on a small scale, the expense of this manufacture is estimated to amount to 10 or 12 cents per pound. Using all the milk of five or six cows, it costs nine cents, while the largest farmer cannot reduce this cost below eight or seven cents. All this is outside of the value of the milk used. The large factories, however, established in the States of New York and Massachusetts, who make cheese for the farmers, or buy their milk, have by proper machinery reduced this cost to only 2½ cents per pound, and it is of course impossible to compete with them if you intend selling your cheese to dealers. If, however, you keep a little cheese store, and sell all you make to consumers chiefly, it may pay. But it is doubtful if you cannot as cheaply buy cheese from the large manufacturers as make it yourself on a small scale. The whey can be utilized in making sugar of milk, as is done in Switzerland; but it appears that in our cheese manufactories it is not used for any such purpose, but returned to the farmers (who bring their milk) in the proportion of two gallons of whey to three of milk. The farmers use the whey to feed their hogs.

Cheltenham Salts.—Glauber salts, Epsom salts, common salts, equal parts, powder. Mix. Dose ½ oz.

Effervescing Cheltenham Salts.—Tartaric acid, dried, 25 parts; tartrate of iron, 1 part; seidlitz salt, 120 parts; mix. Dose, a teaspoonful in a glass of water.

Chemic.—A name given to the acid extract of indigo, unmixed with salts or soda. In some places, the name given to bleaching liquor and bleaching powder.

Chemicals and Drugs, to Pack for Export.—The following suggestions will be found of practical value: 1. Salts should be put in stoppered glass bottles or packed in casks, if sent in large quantities. Casks used for hygroscopic salts should be lined with oil cloth or parchment paper. Salts should never be packed in tin boxes or in paper only.

2. The glass stoppers of all bottles containing either liquids or dry substances should be greased with a little vaseline in order to avoid any difficulty in removing them.

3. Parts of plants, such as leaves, roots, etc., should be packed in sacks, and these again in cases; very delicate drugs in tin boxes. Vegetable powders should be packed in hermetically closed glass bottles or tin boxes. Drugs which occupy much space should be pressed as much as possible before being packed, especially if the shipping freight is calculated according to the bulk of the goods.

4. Boxes and cases should be lined with zinc, or where this is too expensive a strong and good oil cloth will usually be sufficient.

5. Although the utmost care is necessary in packing, yet packing materials, such as hay, straw, etc., should be used as sparingly as possible, as duty has usually to be paid for the weight of these as well as for the goods themselves.

6. Cases should be secured by iron bands, and it is always desirable that the weight and volume of cases should be as small as possible.

7. Acids, caustic or inflammable substances, must be packed according to the regulations of the different railways by which they are transmitted prior to shipment. As a rule stone bottles are best for acids and ammonia and glass or tin vessels for volatile substances. All these should be closed by corks saturated with paraffine, and then wrapped in sail cloth, which, with the string securing it, should also be soaked in paraffine.

8. Acetic acid may be safely conveyed from place to place in carboys of 5 to 10 gal. capacity.

9. Liquor ammonia should never be put into iron vessels.

10. Vessels containing volatile substances should never be quite filled.

11. As acids and caustic and inflammable substances are conveyed on the decks of sailing vessels only, the cases containing them should be well closed, and the address, mark, number, etc., be such as will resist sea water.

12. Liquids should not be packed in the same case with dry substances.

13. Valuable or expensive chemicals, such as ethereal oils and essences, should be packed in strong tin vessels and closed with corks saturated with paraffine as before described.

14. The weights and measures of the country to which the goods are sent should always be used, to avoid loss and inconvenience.

15. Besides observing these rules for packing, consignors of goods should be thoroughly acquainted with the customs tariffs and regulations of the countries to which they are sending, as pecuniary loss and inconvenience may occur from ignorance of them. For instance, if a case contains various substances, the duties on which are different, it is usual in some tariffs to calculate the duty of the whole of the contents of the case or at least of the packing materials at the highest rate. The importance of packing together goods upon which the customs tariffs are similar is self-evident from this.

16. In cases of urgency small quantities of any substance suitable for such transmission, *e. g.*, quinine, antipyrine, salicylic acid, etc., may be sent as patterns without value, and thus avoid the delay caused by the customs office.

Chem-Nomenclature. See **Nomenclature.**

Chemical Reagents. See **Reagents.**

Cherry Cordial. See **Liquors.**

Cherry, Wild.—To ½ gal. sirup, add ¼ oz. artificial essence of black cherry and ½ oz. fruit acid solution. This is improved by the extract of wild cherry. It contains tannic acid and should not be placed in iron.

Chilblains.—A chilblain is an inflammation of the true skin. There are three degrees: First, patches of red skin, generally swollen, and which itch; second, the skin of a purple color, and surrounded by blots or vesications; third, ulceration or sloughing. Causes, etc.: Chilblains are due to the local action of heat following cold. The skin of the toes and sides of the feet is generally attacked. Treatment. Preventive.—Keep the feet dry and warm; if cold, do not warm them at the fire or place them in hot water, but lave them with cold water, and then rub them with dry, cold towels. Chilblains most frequently attack those who are debilitated in health, although, of course, it is not confined to them; hence constitutional treatment is one of the most powerful measures. Remedial.—1. Warm fomentations, and subsequent rubbing with liniments of turpentine, camphorated spirit or tincture of cantharides, 3 drm.; soap liniment, 9 drm.

2. Decoction of poppy capsules, 1 oz.; hot water, 2 oz. If there be much discharge of matter apply bread poultices, and when it ceases, or the inflammation subsides, use creosote ointment. If a chilblain be much inflamed, it is imperative that it be protected from friction of the boot.

3. A small quantity of yellow soap is dissolved in very little water; then methylated spirit is added to just thin it a little, then add, while hot, tincture of iodine drop by drop, stirring it the while; when it begins to change color there is enough. Let get cold, and apply night and morning, letting it dry on. It is only good while the spirit is in it. So it don't keep very long. Do not use if the chilblain is broken.

4. Equal parts of tincture camphor compound and tincture belladonna, to be rubbed in night and morning.

5. A saturated solution of salt in warm water is also good.

6. Local faradization of the parts is also good.

7. Melt together in a suitable vessel 3 oz. beeswax, 3 oz. Venice turpentine, 8 oz. lard, and 1 pt. sweet oil. Stir these well together and raise the temperature till the mixture simmers; then allow to cool. This should be applied to the feet on a piece of cloth when going to bed. A sure protection against this irritating ailment is found in good, dry woolen clothing for the feet.

8. A correspondent of the London *Lancet* recommends a solution of sulphate of copper (4 grn. to the oz.) as an application for chilblains. He has found that to succeed when everything else has failed to effect a cure.

9. *L'Union Medicale* recommends the following application: Oxide of zinc, 2 parts; tannic acid, 1 part; glycerine, 10 parts; balsam of Peru, 8 parts; camphor, 4 parts.

10. According the *Revue Medico-Photographique*, the following is a very convenient economical, and efficacious application for chilblains and "chaps:" Alcohol (85°), 100 parts; glycerine, 25 parts; carbolic acid, 1 part.

Camphor Balls, Camphor Cakes, Chap Balls, Chilblain Balls, etc.—A popular skin cosmetic and preventive of chapping and chilblains, particularly of the hands.

1. Take spermaceti, 2 oz.; white wax (pure), 2 oz.; almond or olive oil, ¼ pt.; melt them together by a gentle heat, add of camphor (cut small), 1 oz.; stir until it is dissolved, and otherwise proceed as directed under "almond cakes."

2. Take clarified suet, 1 lb.; spermaceti, 3 oz.; white wax, 2 oz.; camphor, 1 oz.; as before. Camphor balls are used in the same way as "almond balls."

Lotions for Chilblains.—1. Take sal ammoniac (crushed small), 1 oz.; glycerine (Price's), 1½ oz.; rose water, 8 oz.; agitate them together until solution is complete. An elegant and effective preventive of "chaps" and "chilblains," as well as a remedy for the last before they break; also for roughness of the hands produced by cold. The affected or exposed parts are moistened with the lotion night and morning. Elder flower water, camphor julep, or even distilled or clean soft water, may be substituted for the "rose water" at will.

2. Take of sal ammoniac, 1 oz.; glycerine, 1 oz.; rum (good, strong), ½ pt.; camphor (powdered), 1 drm.; agitate them together frequently for some hours. Very serviceable; used as the last.

3. Take sal ammoniac, 1½ oz.; vinegar (good, strong), ½ pt.; dissolve. Serviceable for unbroken childlains; used as No. 1. Its efficacy is increased by subsequently rubbing the parts, when dry, with a little simple ointment or oil, or cold cream, or pomatum.

4. Take tincture of catechu, 2 fluid oz.; honey (best), 1½ oz.; water, 7 oz.; mix. Used for chaps and chilblains, whether the latter be broken or not; as No. 1.

5. Dr. Grave's "Chilblain Preventive."—Take sulphate of copper, 1 drm.; water, 3 oz.; dissolve.

6. Linnæus's "Remedy for Chilblains."—Take hydrochloric acid (sp. gr. 1·16), 1 oz.; water, 11 oz.; mix. For unbroken chilblains; as Nos. 1 or 3.

Liniments for Chilblains.—1. Take of soap liniment, 2 oz.; tincture of cantharides, 1 oz.; oil of cajeput, 1½ drm.; agitate them well together. Useful for unbroken chilblains. To be applied twice or thrice daily, with friction.

2. Take of oil of turpentine (best), ¼ pt.; camphor (crushed small), 1 oz.; oil of cajeput, 2 drm.; mix, and agitate till solution is complete. Use, etc., as the last.

3. Lejeune's Liniment, Lejeune's Chilblain Balsam.—Take camphor (small), 1 drm.; iodide of potassium, 5 drm.; tincture of benzoin, ¾ fluid oz.; solution of diacetate of lead, 1 fluid oz.; proof spirit (made with rose water), 2½ oz.; mix, dissolve, and add a warm solution of curd soap, 1¼ oz., made with proof spirit (as above), 2½ oz.; and at once bottle it. Use, etc., as No. 1.

4. Morton's Chilblain Liniment.—Take calomel, 1 drm.; camphor (powdered), 1 drm.; oil of turpentine, 2 drm.; cocoa nut oil, 2 drm.; spermaceti ointment, 4 drm. Mix in a warm mortar, and triturate until cold. Use, etc., as No. 1.

5. Vance's Chilblain Cream.—Take ointment of nitrate of mercury, 1 oz.; camphor (powdered), 1 drm.; oil of turpentine, 2 drm.; olive oil, 5 drm.; mix, with a gentle heat, in a Wedgwood ware mortar, and triturate until cold. Use, etc., as No. 1.

Ointments for Chilblains.—1. Take made mustard (best, very thick), 2 drm.; glycerine (Price's), 1 drm.; spermaceti cerate, 1½ drm.; mix in a slightly warmed mortar, and triturate until cold. For unbroken chilblains; to be applied night and morning.

2. Take gall nuts (in very fine powder), 1 drm.; spermaceti cerate, 7 drm.; mix; add of glycerine (Price's), 2 drm.; and rub the whole to a uniform mass. An excellent application to obstinate broken chilblains, particularly when used as a dressing. When the parts are very painful, 1 oz. of compound ointment of galls ("unguentum gallæ compositum," L. Ph.) may be advantageously substituted for the galls and cerate ordered above.

3. Cottereau.—Take acetate of lead, 1 drm.; camphor (in powder), 1 drm.; cherry laurel water, 1 drm.; tar, 1½ drm.; lard, 1 oz.; mix as before.

4. Devergie.—Take creosote, 12 drops; Goulard's extract, 12 drops; extract of opium, 2 grn.; lard, 1 oz.; mix.

5. Giacomini's.—Take lead acetate, 2 drm.; cherry laurel water (distilled), 2 fluid drm.; lard (hard), 1 oz.; mix.

6. Linnæus.—Take spermaceti ointment, 2½ oz.; balsam of Peru, 1 drm.; mix, with a gentle heat; when cooled a little, add of hydrochloric acid, 2 fluid drm., and triturate until cold. For unbroken chilblains.

Chilli Vinegar. See **Vinegar.**

Chimneys, Lamp, to Prevent from Cracking.—Put the chimneys into cold water and gradually heat it until it boils, then let it as gradually cool.

China, Cement for. See **Cements.**

China, Gilding on. See **Gilding.**

Chloralum.—Aluminum chloride sp. gr. 1·15. This is an impure, aqueous solution. Used as a disinfectant.

Chlorodyne.—The following formula is from Baily's Physician's Pharmacopœia:

Hydrochlorate of morphia	4 gr.
Chloroform	48 min.
Rectified ether	32 "
" spirit	32 "
Dilute hydrocyanic acid	32 "
Tincture of Indian hemp	32 "
" " capsicum	24 "
Oil of peppermint, English	3 "
Hydrochloric acid, pure	4 "
Powdered tragacanth	2 gr.
Molasses, dark green	3 drm.
Distilled water, to	1 oz.

Dr. Brown's Chlorodyne contains 5 parts of concentrated muriatic acid and 10 parts each of ether, chloroform, tincture of Cannabis indica (Indian hemp), and tincture of capsicum, 2 parts each of morphine and hydrocyanic acid, 1 part oil of peppermint, 50 parts simple sirup, 3 parts each of tincture of hyoscyamus and tincture of aconite.

Chocolate.—*Spanish Chocolate.*—1. Caracas cocoa, 10 lb.; sweet almonds, 1 lb.; sugar, 3 lb.; vanilla, 1¼ oz.

2. Caracas cocoa, 8 lb.; island cocoa, 2 lb.; white sugar, 10 lb.; aromatics, as above.

3. Island cocoa, 7 lb.; farina q. s. to absorb the oil. Inferior.

Vanilla Chocolate.—A variety of French or Spanish chocolate, highly flavored with vanilla. The following proportions have been recommended:

1. Caracas cocoa, 7 lb.; Mexican vanilla, 1 oz.; cinnamon, ½ oz.; cloves, 3.

2. Best chocolate paste, 21 lb.; vanilla, 4 oz.; cinnamon, 2 oz.; cloves, ½ drm.; musk, 10 gr.

The vanilla used in making chocolate is reduced to powder by rubbing it with a little sugar before adding it to the paste.

French Chocolate.—The proportions used for the best description are said to be: 2 beans of vanilla and 1 lb. of the best refined sugar to every 3 lb. of the choicest cacao nuts.

Purgative Chocolate.—M. Giraud proposes a preparation made as follows:

	Grammes.
Cacao, powdered and freed from oil	50
Sugar, powdered	100
Castor oil	50
Vanilla, powdered	q. s.

Make into tablets. The oil should be incorporated with the cacao and the sugar and vanilla added. The ingredients must be well worked up upon a heated slab, and allowed to cool in moulds.

Cholera Mixture.—1. The following is published as the "Cholera Mixture of the British Army:" Oil of anise seed, 3 drm.; oil of cajeput, 3 drm.; oil of juniper, 3 drm.; ether, 8 drm.; liquor acid of Haller, 1 drm.; tincture of cinnamon, 4 oz. Mix. Dose, ten drops every quarter of an hour, in a tablespoonful of water.

2. A mixture which has accomplished wonders in the writer's hands is this: Acid. tannici, 1 drm.; æth. chlor. (1 in 10), 2 drm.; ac. sulph. dil. 1½ drm.; tinct. zingib., 3 drm.; aq. menth. pip. ad 8 oz. Mix. One-sixth every two or three hours. See also **Diarrhœa.**

Chromic Acid Solution for Batteries.—12 parts by weight potassium bichromate in 150 parts of water, with the addition of 25 parts of sulphuric hydrate.

Chromogens.—A name given to a class of bodies which have in themselves no tinctorial properties, but which pass into true dyes, under the action of the air.

Chromos, to Clean. See **Cleansing.**

Chrysocale. See **Alloys.**

Chrysophanic Acid.—A yellow coloring matter scarcely soluble in water but soluble in alcohol. It exists in the roots of rhubarb and the dock plant, in senna leaves and in the lichen Parmelia paricina. It is of no practical value.

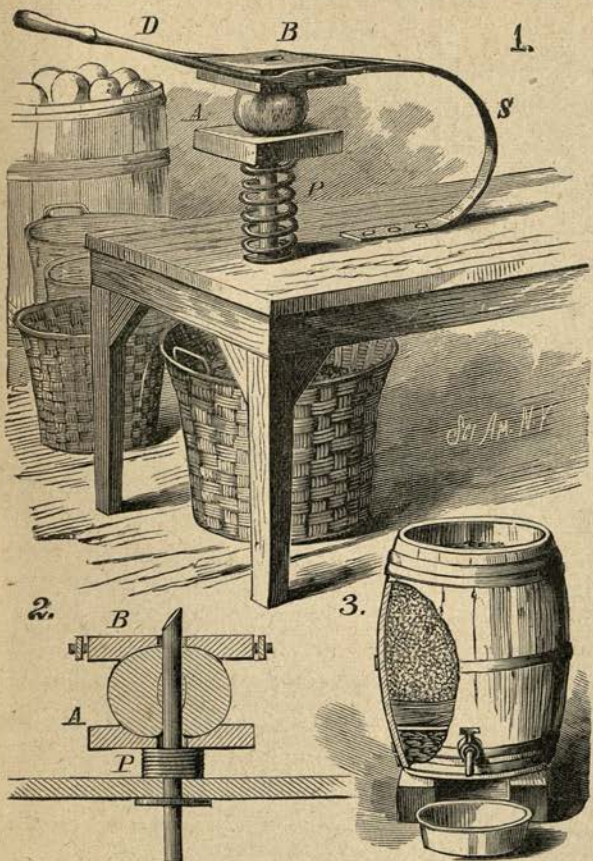
Chrysorin.—(Rauschenberger.) This is a non-oxidizable alloy, and is composed of 100 parts copper and 50·25 to 51·25 part zinc.

Cider.—*How to Make Good Cider and to Keep It.*—In localities where the apple crop is abundant the preparation of cider for market is a profitable industry when intelligently undertaken, and there are few beverages more palatable and less harmful than cider when properly prepared. Unfortunately, there are few farmers who really know how to make good cider or how to care for and keep it when made.

In the first place, apples not perfectly sound and well ripened are not fit for making cider. The russet is one of the best of apples for this purpose, but other and more commonly available varieties need not be slighted.

To prevent bruising the fruit intended for the cider press should always be hand picked. After sweating each apple should be wiped dry, examined, and any damaged or decayed fruit thrown out and used for making vinegar cider.

In the grinding or pulping operation the seed is often crushed and is apt to taint the juice, so that despite the loss and extra time required it is always better to core the apples before grinding them, as the cider will not only taste and look better, but keep better. A cheap and handy coring machine is shown in Fig. 1. In this the coring tube, which may be of tin, free from iron rust, projects through a common bench or table, and is surrounded by an ordinary furniture spring, P, which supports a piece of wood, A. This has a hole in the center of it, over



CORING MACHINE. FILTER.

and partly into which the apple is placed. The lever, D, on which the piece of wood, B, similar to A, but having an aperture only large enough to admit the coring tube, is loosely hung by side pins, is held in position by the spring, S. The operation of the machine will be readily understood by referring to Fig. 2, in which it is shown in section.

All ironwork about the mill or press (rings, rivets, etc.) should be tinned or coated with good asphaltum varnish, as the color and sometimes taste of the cider are apt to be affected by contact with the rusty metal.

In pressing the pomace many of the best cider makers prefer to use hair cloth in place of straw between the layers, as it is more cleanly and does not affect the taste of or add anything to the expressed juice.

As the cider runs from the press it should be filtered through a hair sieve into a clean wooden vessel capable of holding as much juice as can be extracted in one day.

Under favorable conditions the fine pomace will rise to the surface in about twenty-four hours—sometimes less—and in a short time grow very thick. Then it should be watched, and when white bubbles begin to appear at the surface, the liquid should be drawn off slowly from a faucet placed about three inches from the bottom of the tank, so as not to disturb the lees. The liquid drawn off should be received in clean, sweet casks, and must be watched. As soon as white bubbles of gas appear at the bunghole, it must be drawn off (racked) into clean casks as before, and this racking repeated as often as necessary until the first fermentation is completely at an end. Then the casks should be filled up with cider in every respect like that already contained in it and bunged up tight. Many cider makers add a gobletful of pure olive oil to the cider before finally putting in the bung and storing.

If it is desired to keep cider perfectly sweet—and this is rarely the case—it should be filtered on coming from the press, and then sulphured by the addition of about one-quarter ounce of calcium sulphite (sulphite of lime) per gallon of cider, and should be kept in small, tight, full barrels. The addition of a little sugar—say one-quarter of a pound per gallon—improves the keeping qualities of tart cider.

An easily constructed cider filter is shown in Fig. 3, and consists in a barrel provided with a tap near the bottom. The lower part is filled with dry wood chips covered with a piece of flannel. Over this a layer of clean rye straw is packed down, and then the barrel is filled with clean quartz sand, not too fine.

When the first fermentation of cider has been checked and the liquid barreled, it should be allowed to stand until it acquires the proper flavor.

Much of the excellency of cider depends upon the temperature at which the fermentation is conducted. The casks containing the juice should be kept in a cellar, if possible, where the temperature does not exceed 50° Fah. When left exposed to the air, or kept in a warm place, much of the sugar is converted into vinegar and the liquor becomes hard and rough. On the contrary, when the fermentation is conducted at a low temperature, nearly the whole of the sugar is converted into alcohol and remains in the liquid instead of undergoing acetification. The change from alcohol to vinegar (acetous fermentation) goes on most rapidly at a temperature of about 95° Fah., and at a lower temperature the action becomes slower, until at 46° Fah. no such change takes place. Independently of the difference in quality of fruit used, the respect of temperature is one of the chief causes of the superiority of the cider made by one person over that made by another in the same neighborhood.

The more malic acid and less sugar present, the less the tendency to acetous fermentation; hence it often happens that tart apples produce the best cider. But cider made from such apples can never equal in quality that prepared at a low temperature from fruit rich in sugar, which, if properly cared for, will keep good twenty years.

When the first fermentation has subsided, and the liquor has developed the desired flavor in storage, it is drawn off into other barrels which have been thoroughly cleansed and sulphured, either by burning in the bunghole a clean rag dipped in sulphur or, what is better, by thoroughly rinsing the inside with a solution of bisulphite of calcium prepared by dissolving about a quarter pound of the sulphite in a gallon of water.

The isinglass—six ounces or more (in solution) to the barrel—should be stirred in as soon as transferred, and then a sufficient quantity of preserving powder of bisulphite of lime (not sulphate or sulphide), previously dissolved in a little of the cider, to entirely check fermentation. The quantity of this substance required rarely exceeds a quarter of an ounce to the gallon of cider. A large excess must be avoided, as it is apt to injuriously affect the taste.

Some makers sweeten their cider by additions, before fining, of sugar or glucose, the quantity of the former varying from three-quarters of a pound to one and a half pounds, while as a substitute about three times this quantity of glucose is required. Sweetened cider, when properly cared for, develops by aging a flavor and sparkle resembling some champagnes. Such ciders are best bottled when fined.

The following are the methods by which some of the beverages found in the market under the name of "champagne cider" are made:

1. Cider (pure apple) ..... 3 bbl.
   Glucose sirup (A)..... 4 gal.
   Wine spirit..... 4 "

The glucose is added to the cider, and after twelve days' storage in a cool place the liquid is clarified with one-half gallon of fresh skimmed milk and eight ounces of dissolved isinglass. The spirit is then added and the liquor bottled on the fourth day afterward.

2. Pale vinous cider ..... 1 hhd.
   Wine spirit..... 3 gal.
   Glucose about ..... 30 lb.

The liquid is stored in casks in a cool place for about one month, when it is fined down with two quarts of skimmed milk and bottled. Much of this and similar preparations are doubtless sold for genuine champagne.

3. Pineapple cider..... 20 gal.
   Wine spirit..... 1 "
   Sugar..... 6 lb.

Fine with one gallon of skimmed milk after two weeks' storage in wood and bottle.—*Scientific American Supplement.*

Cider, Artificial.—Soft water, 25 gal.; tartaric acid, 2 lb.; New Orleans sugar, 25 lb.; yeast, 1 pt. Put into clean cask with bung out, and allow to stand twenty-four hours. Then add 3 gal. spirits and let stand forty-eight hours. It will keep well if not left exposed to the air, and if the cask is sweet.

Bottling Cider.—To have good bottled cider, it is necessary first that care should be taken in its manufacture. Apples picked by hand and perfectly ripe and sound are essential to the best quality. They should lie some time after picking. They should then be sorted, their surface wiped dry, and all the rotten fruit rejected. The cider may then be made in the usual manner by grinding and pressing. The cider should then be stored in a cool place to mature. After three or four months it should be racked off carefully, and then fined by adding to each hogshead a pound of isinglass finings. In two weeks from the time that the finings are added it should be again racked off, and if found sufficiently clear and sparkling it is ready for bottling; if not, it should be again fined and allowed to stand two weeks. Before bottling, the bung should be left out of the casks for ten or twelve hours to permit the escape of carbonic acid gas. The cider may then be placed in bottles, and the corks loosely placed in. The bottles should then be allowed to stand twenty-four hours. The corks may then be driven in and wired down. If the corks are driven in and wired when the cider is first put into the bottles there will be great danger of breaking the bottles by the accumulating pressure of the gas. All additions of flavoring materials are a decided damage to cider made from a fine quality of fruit, though they may improve juice of a poor quality. If the directions here given be strictly followed, a delicious cider will be produced.

Cider, to Can.—Cider may be preserved sweet for years by putting it up in airtight cans, after the manner of preserving fruit. The liquor should be first settled and racked off from the dregs, but fermentation should not be allowed to commence before canning.

Champagne Cider.—Good, pale vinous cider, 1 hhd.; proof spirit, 3 gal.; honey or sugar, 14 lb. Mix well, and let them remain together in a moderately cool place for one month, then add orange flower water, 3 pt., and in a few days fine it down with skimmed milk, ½ gal. A similar article, bottled in champagne bottles, silvered and labeled, is said to be sometimes sold for champagne.

Cider, to Clear.—Ground horseradish, 4 pts.; nearly 1 lb. of thick gray filtering paper to the barrel; shake or stir, until the paper has separated into small shreds; let it stand twenty-four hours, then draw off the cider by means of a siphon or stopcock.

Cider, to Improve.—Cider, 1 hogshead; rum, weak flavored, 2 gal.; alum, dissolved, 1 lb.; honey or coarse sugar, 15 lb.; sugar coloring, q. s.; bitter almonds, ½ lb.; cloves, ½ lb.; mix, and after three or four days fine down with isinglass. For champagne cider, omit the coloring, and fine with 2 qts. milk; this will render it very pale.

Cider, to Keep.—1. Place in each barrel immediately on making, mustard, 4 oz.; salt, 1 oz.; ground chalk, 1 oz. Shake well.

2. Mustard seed, 1 oz.; allspice, 1 oz.; olive ¼ pt.; alcohol, ½ pt.

Made Cider.—An article under this name is made in Devonshire, chiefly for the supply of the London market, it having been found that the ordinary cider will not stand a voyage to the metropolis without some preparation. The finest quality of made cider is simply ordinary cider racked into clean and well-sulphured casks; but the mass of that which is sent to London is mixed with water, molasses and alum. The cider sold in London under the name of Devonshire cider would be rejected even by the farmers' servants in that county.

How to Preserve Cider.—A pure, sweet cider is only obtainable from clean, sound fruit, and the fruit should therefore be carefully examined and wiped before grinding.

In the press, use hair cloth or gunny in place of straw. As the cider runs from the press, let it pass through a hair sieve into a large open vessel that will hold as much juice as can be expressed in one day. In one day, or sometimes less, the pomace will rise to the top, and in a short time grow very thick. When little white bubbles break through it, draw off the liquid through a very small spigot placed about 3 in. from the bottom, so that the lees may be left behind. The cider must be drawn off into very clean, sweet casks, preferably fresh liquor casks, and closely watched. The moment the white bubbles, before mentioned, are perceived rising at the bunghole, rack it again. It is usually necessary to repeat this three times. Then fill up the cask with cider in every respect like that originally contained in it, add a tumbler of warm, sweet oil, and bung up tight. For very fine cider it is customary to add at this stage of the process about ½ lb. of glucose (starch sugar) or a smaller portion of white sugar. The cask should then be allowed to remain in a cool place until the cider has acquired the desired flavor. In the meantime clean barrels for its reception should be prepared, as follows: Some clean strips of rags are dipped in melted sulphur, lighted and burned in the bunghole, and the

bung laid loosely on the end of the rag so as to retain the sulphur vapor within the barrel. Then tie up ½ lb. of mustard seed in a coarse muslin bag, and put it in the barrel, fill the barrel with cider, add about ¼ lb. of isinglass or fine gelatine dissolved in hot water.

This is the old-fashioned way, and will keep cider in the same condition as when it went into the barrel, if kept in a cool place, for a year.

Professional cider makers are now using calcium sulphite (sulphite of lime), instead of mustard and sulphur vapor. It is much more convenient and effectual. To use it, it is simply requisite to add ⅛ to ¼ of an ounce of the sulphite to each gallon of cider in the cask, first mixing the powder in about a quart of the cider, then pouring it back into the cask and giving the latter a thorough shaking or rolling. After standing bunged several days to allow the sulphite to exert its full action, it may be bottled off.

The sulphite of lime (which should not be mistaken for the sulphate of lime) is a commercial article, costing about 40 cents a lb. by the barrel. It will preserve the sweetness of the cider perfectly, but unless care is taken not to add too much of it, it will impart a slight sulphurous taste to the cider. The bottles and corks used should be perfectly clean, and the corks wired down.

A little cinnamon, wintergreen, or sassafras, etc., is often added to sweet cider in the bottle, together with a drachm or so of bicarbonate of soda at the moment of driving the stopper. This helps to neutralize the acids, and renders the liquid effervescent when unstoppered; but if used in excess it may prejudicially affect the taste.

Raisin Cider.—This is made in a similar way to raisin wine, but without employing sugar, and with only 2 lb. of raisins to the gallon, or even more, of water. It is usually fit for bottling in ten days, and in a week longer is ready for use.

See *Wines (British).*

Cider, to Keep Sweet.—When the cider has reached the flavor required, add 1 to 2 tumblers of grated horseradish to each barrel of cider.

Cheap Cider.—Mix well together 10 gal. cold water, 7½ lb. brown sugar, ¼ lb. tartaric acid, add the juice expressed from 2 or 3 lb. dried sour apples, boiled.

Cider Vinegar. See **Vinegar.**

Cigarettes, Scenting.—Take lign. santal flav., 1 oz.; cort. cinnamonis, 1 oz.; flor. lavand., 2 oz.; caryophylli, ¼ oz.; mix.

Cigars, Flavor for.—1. Macerate 2 oz. of cinnamon and 4 oz. of tonka beans in 1 qt. of rum. The beans must be ground fine. Inferior tobacco may be given a very fair flavor with preparation.

2. Tincture tonka beans, 12 oz.; fluid extract valerian, 1½ oz.; alcohol, 3½ oz.

3. Moisten ordinary cigars with a strong tincture of cascarilla, to which a little gum benzoin and storax may be added. Some persons add a small quantity of camphor, or oil of cloves or cassia.

4. Soak the tobacco of which the cigars are to be made, for a short time, in a very strong infusion of cascarilla, and then allow it to dry by a very gentle heat.

5. Insert very small shreds of cascarilla bark between the leaves of the cigar, or in small slits made for the purpose. The above yield a very agreeable odor when smoked; but are said to intoxicate quicker than unprepared cigars of equal strength and quality. They lose much of their fragrance by age.

Cinnamon Cordial. See **Liquors.**

Cinnamon Water. See **Waters.**

Cisterns, Capacity of Cylindrical.—The *Sanitary News* gives the following table showing the capacity in gallons for ten inches in depth of cylindrical cisterns of any diameter:

Diameter.	Gallons.	Diameter.	Gallons.
25 feet.	3,059	7 feet.	239
20 "	1,958	6½ "	206
15 "	1,101	6 "	176
14 "	959	5 "	122
13 "	827	4½ "	99
12 "	705	4 "	78
11 "	592	3 "	44
10 "	489	2½ "	30
9 "	396	2 "	19
8 "	313		

Citrate of Magnesia. See **Magnesia, Citrate of.**

Citric Acid, to Make from Fruit.—Citric acid is generally manufactured from lemon juice, which is imported in a concentrated state produced by evaporation by heat. It consists of citric acid 6 to 7%, alcohol 5 to 6, and the remainder water, inorganic salts, etc. By some manufacturers it is allowed to partially ferment for the purpose of evaporating the clear liquor from the mucilage, or it may be clarified in the usual method by the use of albumen in the form of the white of an egg. Carbonate of lime in fine powder is gradually added, and stirred in so long as effervescence continues. Citrate of lime forms, and after being separated by drawing off the watery liquor, is well washed with warm water. It is then ultimately mixed with strong sulphuric acid diluted with 6 parts of water. After some hours the citrate is decomposed, the sulphuric acid having taken up the lime and formed an insoluble sulphate, setting the citric acid free. This, separated by decanting and filtering, is evaporated in leaden pans till it attains the specific gravity 1·13. The evaporation is afterward continued by a water or steam bath till the liquor begins to be sirupy, or to be covered with a thin pellicle. It is then removed from the fire, and put aside to crystallize, the mother liquor after a few days being evaporated as above, and again set to crystallize, and so on as long as clear crystals are obtained. To obtain pure citric acid, all the crystals should be redissolved and recrystallized, it may be several times, and the solution digested with bone black. A gallon of lemon juice should make about 8 oz. of crystals. Limes and lemons constitute the source from which citric acid is generally made, yet it may be extracted from oranges, currants, gooseberries, raspberries, tamarinds, etc. The machinery and cost of manufacture will depend upon circumstances which any one about to go into the business can best judge.

Citron. See **Liquors.**

Claret Cup.—1 bottle of claret, 1 bottle of soda water, ½ tumbler of iced water, ½ lemon sliced; put in small lumps of ice, and sweeten with sugar. Or claret and champagne cup: 1 bottle of claret or champagne, 1 large wineglass of sherry, a tumbler and ½ of seltzer water, balm and borage, peel of lemon, very thin, 1 slice of cucumber, to be sweetened to taste and highly iced.

Claret Wine. See **Wines.**

Clarification.—The depuration or removal of substances from liquids, by the admixture of some substance, usually albumen in some form, as milk, white of egg, or a solution of gelatine, which by being coagulated entangles and precipitates the contained impurities, rendering the liquid clear. The addition of vegetable acids will clarify the expressed juices of plants by causing coagulation and precipitation of their pectine or vegetable albumen, and thus fit them for sirups. Albumen, gelatine acids, certain salts, blood, lime, plaster of Paris, alum, heat, alcohol, etc., serve in many cases for this purpose. The first is used under the form of white of egg, for the clarification of sirups, as

it combines with the liquid when cold, but on the application of heat rapidly coagulates and rises to the surface, carrying the impurities with it, forming a scum which is easily removed with a skimmer. It is also much used for fining wines and liqueurs, particularly the red wines and more limpid cordials. Gelatine, under the form of isinglass, dissolved in water or weak vinegar, is used to fine white wines, beer, cider, and similar liquors, that contain a sufficient quantity of either spirit or astringency (tannin) to induce its precipitation. Sulphuric acid is frequently added to weak liquors for a similar purpose, either alone, or after the addition of white of egg or gelatine, both of which it rapidly throws down in an insoluble form. Lead acetate is frequently used, but the practice is dangerous.

Clark's Patent Alloy. See **Alloys.**

Clay Plaster.—Make a paste of rye flour and water and add ⅛ its bulk of dry clay. Use no more water than is necessary to make a smooth paste.

Cleansing, Renovating and Protecting.—This section of the work includes laundry work and the removal of spots and stains.

Acid Stains, to Remove.—1. Chloroform will restore the color of garments, where the same has been destroyed by acids. See No. 2.

2. When acid has accidentally or otherwise destroyed or changed the color of the fabric, ammonia should be applied to neutralize the acid. A subsequent application of chloroform restores the original color.

3. Spots produced by hydrochloric or sulphuric acid can be removed by the application of concentrated ammonia, while spots from nitric acid can scarcely be obliterated.

Acids, Vinegar, Sour Wine, Must, Sour Fruits.—White goods, simple washing, followed up by chlorine water if a fruit color accompanies the acid. Colored cottons, woolens, and silks are very carefully moistened with dilute ammonia, with the finger end. (In case of delicate colors, it will be found preferable to make some prepared chalk into thin paste, with water, and apply it to the spots.)

Alabaster, to Clean.—1. The best method of cleaning these ornaments is to immerse them for some time in milk of lime, and then wash in clean water, and when dry dust them with a little French chalk. Milk of lime is made by mixing a little slaked lime in water. This has a "milky" appearance, whence its name. Benzol or pure oil of turpentine is very highly recommended.

2. Use soap and water, with a little washing soda or ammonia, if necessary. Rinse it thoroughly.

Alkali Stains.—To remove from garments. A mixture of acetic acid, diluted with a large quantity of water, will remove stains brought by soda, soap, boilers, lye, etc., if the solution is readily applied.

Aniline from the Hands, to Remove Stains of.—Wash with strong alcohol, or what is more effectual, wash with a little bleaching powder, then with alcohol.

Animals, Stuffed, to Clean.—Give the animal a good brushing with a stiff clothes brush. After this warm a quantity of new bran in a pan, taking care it does not burn, to prevent which, quickly stir it. When warm, rub it well into the fur with your hand. Repeat this a few times, then rid the fur of the bran, and give it another sharp brushing until free from dust.

Balls, Scouring.—1. Curd soap, 8 oz.; oil of turpentine and oxgall, of each 1 oz. Melt the soap, and when cooled a little, stir in the rest, and make it into cakes while warm.

2. Soft soap and fuller's earth, each 1 lb.; beat them well together in a mortar, and form into cakes. To remove grease, etc., from cloth. The spot first moistened with water is rubbed with the cake, and allowed to dry, when it is well rubbed with a little warm water, and afterward rinsed or rubbed off clean.

Barometer Tubes, to Clean.—Try a small quantity of warm nitric acid. Then rinse with water, rinse with absolute alcohol, and finally with ether; warm to expel the vapor of ether.

Barrels, to Cleanse.—Put a few pounds unslaked lime in the barrel, add water, and cover. In a short time add more water and roll the barrel. Rinse with clean water.

Blackboards, to Remove Grease from.—Make a strong lye of pearlashes and soft water, and add as much unslaked lime as it will take up. Stir it together and let it settle a few minutes, bottle it and stopper close. Have ready some water to dilute it when used, and scour the part with it. The liquor must not remain long on the board, as it will draw the color with it. Hence use it with care and expedition.

Blankets, to Cleanse.—1. Put two large tablespoonfuls of borax and a pint bowl of soft soap into a tub of cold water. When dissolved put in a pair of blankets, and let them remain overnight. Next day rub and drain them out, and rinse thoroughly in two waters, and hang them up to dry. Do not wring them.

2. Scrape 1 lb. soda soap, and boil it down in sufficient water, so that when cooling you can beat it with the hand to make a sort of jelly. Add 3 tablespoonfuls spirit of turpentine and 1 tablespoonful of spirit of hartshorn, and with this wash the article well and rinse in cold water until all the soap is taken off. Then apply salt and water and fold between two sheets, taking care not to allow two folds of the article washed to tie together. Smooth with a cool iron. Only use the salt where there are delicate colors that may run. If you can get potash soap, it will be better, as woolen manufacturers do not use soda soap.

Blood Stains, to Remove.—1. An accidental prick of the finger frequently spoils the appearance of work, and if for sale, decreases its value. Stains may be entirely obliterated from almost any substance by laying a thick coating of common starch over the place. The starch is to be mixed as if for the laundry, and laid on quite wet.

2. The free and early application of a weak solution of soda or potash, and the subsequent application of the solution of alum, is recommended.

Blood and Albuminoid Matters.—Steeping in lukewarm water. If pepsine, or the juice of *Carica papaya*, can be procured, the spots are first softened with lukewarm water, and then either of these substances is applied.

Bluing, Laundry. See **Bluing.**

Bones and Ivory, to Clean and Prepare.—1. The curators of the anatomical museum of the Jardin des Plante shave found that spirits of turpentine is very efficacious in removing the disagreeable odor and fatty emanations of bones or ivory, while it leaves them beautifully bleached. The articles should be exposed in the fluid for three or four days in the sun, or a little longer if in the shade. They should rest upon strips of zinc, so as to be a fraction of an inch above the bottom of the glass vessel employed. The turpentine acts as an oxidizing agent, and the product of the combustion is an acid liquor which sinks to the bottom, and strongly attacks the ivory if allowed to touch it.

2. Make a thick paste of common whiting in a saucer. Brush well with a toothbrush into the carved work. Brush well out with plenty of clean water. Dry gently near the fire. Finish with a clean dry hard brush, adding one or two drops (not more) of alcohol.

3. Mix about a tablespoonful of oxalic acid in ½ pt. of boiling water. Wet the ivory over first with water, then with a toothbrush apply the acid, doing one side at a time and rinsing, finally drying it in a cloth before the fire, but not too close.

4. Take a piece of fresh lime, slake it by sprinkling it with water, then mix into a paste,

which apply by means of a soft brush, brushing well into the interstices of the carving; next set by in a warm place till perfectly dry, after which take another soft brush and remove the lime. Should it still remain discolored, repeat the process, but be careful to make it neither too wet nor too hot in drying off, or probably the article might come to pieces, being most likely glued or cemented together. If it would stand steeping in lime water for twenty-four hours, and afterward boiling in strong alum water for about an hour and then dried, it would turn out white and clean. Rubbing with oxide of tin (putty powder) and a chamois leather will restore a fine gloss afterward.

5. Clean well with spirits of wine, then mix some whiting with a little of the spirits, to form a paste, and well brush with it. It is best to use a rubber of soft leather where there are no delicate points; put a little soap on the leather, and dip into the paste and rub the ivory until you get a brilliant polish, finish off with a little dry whiting; the leather should be attached to a flat wood surface and rub briskly.

6. When ivory ornaments get yellow or dusky looking, wash them well in soap and water, with a small brush to clean the carvings, and place them while wet in full sunshine; wet them two or three times a day for several days with soapy water, still keeping them in the sun, then wash them again, and they will be beautifully white. To bleach ivory, immerse it for a short time in water containing a little sulphurous acid, chloride of lime or chlorine.

7. Soda ash, 1 lb.; lime (burned), ½ lb.; hot water, 3 qt. Mix, and soak the bones for twenty-four hours in the liquid; wash them thoroughly and bleach them.

8. Put the bones in a strong warm alcoholic solution of caustic potash for a short time, then immerse in running water.

Bonnets, Chip or Straw.—To Clean.—Wash in warm soap liquor, well brushing them both inside and out, then rinse in cold water, and they are ready for bleaching.

To Bleach.—Put a small quantity of salts of sorrel or oxalic acid into a clean pan, and pour on it sufficient scalding water to cover the bonnet or hat. Put the bonnet or hat into this liquor, and let it remain in it for about five minutes; to keep it covered hold it down with a clean stick. Dry in the sun or before a clear fire. Or, having first dried the bonnet or hat, put it, together with a saucer of burning sulphur, into a box with a tight-closing lid. Cover it over to keep in the fumes, and let it remain for a few hours. The disadvantage of bleaching with sulphur is that the articles so bleached soon become yellow, which does not happen to them when they are bleached by oxalic acid.

To Finish or Stiffen.—After cleaning and bleaching, white bonnets should be stiffened with parchment size. Black or colored bonnets are finished with a size made from the best glue. Straw or chip plaits, or leghorn hats and bonnets, may also be cleaned, bleached and finished as above.

Books, Removal of Stains from, and Cleaning.—1. Dust can be removed by using bread or very soft rubber.

2. Water stains are removed by boiling water and alum. It will be necessary to float the sheet on this bath for some hours. Dry between clean blotting paper. The amount of alum is immaterial.

3. Damp stains are treated the same way, but with less chance of success.

4. Mud.—Very little can be done. Wash in cold water, then in dilute hydrochloric acid and afterward in a weak solution of chloride of lime. Rinse and dry.

5. Fox Marks.—Use very dilute hydrochloric acid or Javelle water.

6. Finger Marks.—Very difficult to erase. Apply a jelly of white or curd soap, then wash with a brush in cold water.

7. Blood Stains.—Soak in cold water, wash with soap and rinse.

8. Ink stains (of writing ink) usually try oxalic acid followed by chloride of lime. Wash well.

9. Ink Stains (Marking Ink, etc.).—Apply tincture of iodine. The silver in the ink forms silver iodide, which is removed by weak solution of potassium cyanide (deadly poison).

10. Grease Spots.—Put over the spot a piece of blotting paper, apply a hot iron.

11. Or, apply Fr. chalk, put a piece of paper over it and apply the iron.

12. Or, try ether or benzine, put blotting paper above and below the spot.

Blottles, Ink, to Clean.—For cleaning ink bottles, the best and quickest agent is oxalic acid, but it is a violent poison. Try shaking small nails, with water or vinegar in them, and if this does not answer, use hydrochloric acid, carefully washing out two or three times after its application.

Bottles, to Clean Oily or Greasy.—Pour into them a little strong sulphuric acid; after they have been allowed to drain as much as possible, the bottle is then corked, and the acid caused to flow into every portion of it, for about five minutes. It is then washed with repeated rinsings of cold water. All traces of oil or grease left will be removed in a very expeditious manner, and no odor whatever will be left in the bottle after washing.

Brass, to Clean.—1. There are many substances and mixtures which will clean brass. Oxalic acid, muriatic acid, and several other acids will clean brass very effectively; oxalic acid is the best, but the acids must be well washed off, the brass dried, and then rubbed with sweet oil and tripoli, otherwise it will soon tarnish again. Mixture to clean brass is: soft soap, 1 oz.; rotten stone, 2 oz.

2. Oxalic acid, 1 oz.; rotten stone, 2 oz.; sweet oil, 1½ oz.; spirits of turpentine enough to make a paste. When used, a little water is added and friction applied. If brass is very dirty, it requires a strong acid to make it bright; such is chromic acid, best prepared by mixing bichromate of potassa, sulphuric acid, and water, equal parts of each. This makes the dirtiest brass bright and clear at once, but it must be immediately washed off with plenty of water, rubbed dry, and polished with rotten stone. There are no patents on any of these proceedings; and if there were, the patentees would not be sustained in their claims.

3. Wash with rock alum, boiled in a strong lye in the proportion of 1 oz. to 1 pt.; polish with dry tripoli.

4. The government method prescribed for cleaning brass, and in use at all the United States arsenals, is claimed to be the best in the world. The plan is to make a mixture of 1 part common nitric acid and ½ part sulphuric acid, in a stone jar, having also ready a pail of fresh water and a box of sawdust. The articles to be treated are dipped into the acid, then removed into the water, and finally rubbed with sawdust. This immediately changes them to a brilliant color. If the brass has become greasy, it is first dipped in a strong solution of potash and soda in warm water; this cuts the grease, so that the acid has free power to act.

5. Rub the surface of the metal with rotten stone and sweet oil, then rub off with a piece of cotton flannel, and polish with soft leather. A solution of oxalic acid rubbed over tarnished brass soon removes the tarnish, rendering the metal bright. The acid must be washed off with water, and the brass rubbed with whiting and soft leather. A mixture of muriatic acid and alum dissolved in water imparts a golden color to brass articles that are steeped in it for a few seconds.

6. First boil your articles in a pan with ordinary washing soda, to remove the old lac-

quer; then let them stand for a short time in dead nitric acid; then run them through bright dipping nitric acid. Swill all acid off in clean water, and brighten the relieved parts with a steel burnisher, replace in clean water, and dry out in beech sawdust. Next place your work on the stove till heated, so that you can with difficulty bear your hand on articles, and apply pale lacquer with brush; the work will burn if heated too much or too rapidly.

7. Put a coat of nitric acid over the part you want cleaned, with a piece of rag; as soon as it turns a light yellow, rub it dry and the brass will present a very clean appearance; if not satisfactory, repeat.

8. Oxalic acid and whiting mixed and applied wet, with brush, and brushed again when dry with soft plate brush to polish with dry whiting.

9. Brass Instruments.—If the instruments are very much oxidized, or covered with green rust, first wash them with strong soda and water. If not so very bad, this first process may be dispensed with. Then apply mixture of 1 part common sulphuric acid and 12 parts of water, mixed in an earthen vessel, and afterward polish with oil and rotten stone, well scouring with oil and rotten stone, and using a piece of soft leather and a little dry rotten stone to give a brilliant polish. In future cleaning, oil and rotten stone will be found sufficient.

10. Take a strip of coarse linen, saturate with oil and powdered rotten stone, put round the tubing of instrument, and work backward and forward; polish with dry rotten stone. Do not use acid of any kind, as it is injurious to the joints. To hold the instrument, get a piece of wood turned to insert in the bells; fix in a bench vise. The piece of wood will also serve for taking out any dents you may get in the bells.

11. Oil and rotten stone for this purpose, though very efficacious, are objectionable on account of dirt, the oil finding its way to the pistons, and because the instrument cleaned in this manner so soon tarnishes. Dissolve some common soda in warm water, shred into it some scraps of yellow soap, and boil it till the soap is all melted. Then take it from the fire, and when it is cool add a little turpentine and sufficient rotten stone to make a stiff paste. Keep it in a tin box covered from the air, and if it gets hard, moisten a small quantity with water for use.

12. If very much oxidized or covered with green rust, first wash it with strong soda and water. If not so very bad, this first process may be dispensed with. Then apply a mixture of 1 part of common sulphuric acid and 12 parts of water, mixed in an earthen vessel; wash well, first with clear water, and then with water containing some ammonia, afterward scouring well with oil and rotten stone, and using a piece of soft leather and a little dry rotten stone to give a brilliant polish. In subsequent cleaning oil and rotten stone will be found sufficient.

13. Brass work that is so dirty by smoke and heat as not to be cleaned with oxalic acid, should be thoroughly washed or scrubbed with soda, or potash water, or lye. Then dip in a mixture of equal parts of nitric acid, sulphuric acid, and water; or, if it cannot be conveniently dipped, make a swab of a small piece of woolen cloth upon the end of a stick, and rub the solution over the dirty or smoky parts; leave the acid on for a minute, and then wash clean and polish.

14. Paste for Cleaning Brass.—Starch, 1 part; powdered rotten stone, 12 parts; sweet oil, 2 parts; oxalic acid, 2 parts; water to mix.

15. *Prep.*—Soft soap, 2 oz.; rotten stone, 4 oz.; beat them to a paste.

16. Rotten stone made into a paste with sweet oil.

17. Rotten stone, 4 oz.; oxalic acid, 1 oz.; sweet oil, 1½ oz.; turpentine enough to make a paste.

To Clean Brass.—The first and last are best applied with a little water. The second, with a little spirits of turpentine or sweet oil. Both require friction with soft leather.

18. Oxalic acid, 1 part; iron peroxide, 15 parts; powdered rotten stone, 20 parts; palm oil, 60 parts; petrolatum, 4 parts. See that solids are thoroughly pulverized and sifted, then add and thoroughly incorporate oil and petrolatum.

Cleaning Brass Inlaid Work.—Mix tripoli and linseed oil, and dip felt into the preparation. With this polish. If the wood be rosewood or ebony, polish it with finely powdered elder ashes, or make a polishing paste of rotten stone, a pinch of starch, sweet oil, and oxalic acid, mixed with water.

Brass Gas Fixtures, to Restore. — Have the water clean and boiling in two vessels. Dip in one water and then in the next as soon as taken from the nitric acid bath, so that there shall be no traces of acid on the fittings. Dry in boxwood sawdust while hot, and place upon a piece of hot sheet iron over a stove. As soon as all traces of water have left, quickly lacquer with very thin shellac varnish, using a camel's hair brush. You can make the lacquer, by dissolving shellac in best alcohol. Do not touch the metal with the fingers before lacquering.

Brass Gun Shells, to Clean.—For such as have been used, boil in a strong solution of caustic soda, rinse in hot water, then dip in a hot pickle of sulphuric acid, 1 part; water, 4 parts; and rinse in hot water.

Britannia Metal, to Clean.—Use finely powdered whiting, 2 tablespoonfuls of sweet oil and a little yellow soap. Mix with spirits of wine to a cream. Rub on with a sponge, wipe off with a soft cloth, and polish with a chamois skin.

Broadcloth, to Remove Stains from. — Grind fine 1½ oz. pipe clay; mix with 18 drops of alcohol and the same quantity spirits of turpentine. Moisten a little of this mixture with alcohol and rub on the stains. When dry, rub off with a woolen cloth.

Bronze, to Cleanse.—Clean the surface, first of all, with whiting and water, or crocus powder, until it is polished; then cover with a paste of plumbago and crocus, mixed in the proportions that will produce the desired color. Heat the paste over a small charcoal fire. Perhaps the bronzing has been produced by a corrosive process; if so, try painting a solution of sulphide of potassium over the cleaned metal.

Bronze Statuary, to Clean.—Use weak soapsuds or aqua ammonia.

Brushes, to Wash.—Dissolve a piece of soda in some hot water, allowing a piece the size of a walnut to a quart of water. Put the water into a basin, and after combing out the hair from the brushes, dip them, bristles downward, into the water and out again, keeping the backs and handles as free from the water as possible. Repeat this until the bristles look clean; then rinse the brushes in a little cold water; shake them well, and wipe the handles and backs with a towel, but not the bristles, and set the brushes to dry in the sun, or near the fire; but take care not to put them too close to it. Wiping the bristles of a brush makes them soft, as does also the use of soap.

Calico and Linen, to Clean.—1. When linen or calico is discolored by washing, age, or lying out of use, the best method of restoring the whiteness is by bleaching in the open air, and exposure on the grass to the dews and winds. There may occur cases, however, where this may be difficult to accomplish, and where a quicker process may be desirable, and the following is the best:

2. Lay the linen for twelve hours in a lye formed of 1 lb. soda to a gal. of boiling hot soft water; then boil it for half an hour in the same liquid. Then make a mixture of chloride of lime with 8 times its quantity of water, which

must be well shaken in a stone jar for three days, then allowed to settle, and being drawn off clear, the linen must be steeped in it thirty-six hours, and then washed out in the ordinary way. This will remove all discoloration.

Chairs, Cane-seated, Renovating.—1. Clean the articles with a solution of oxalic acid. Their color will be restored.

2. Wash with hot water and a sponge, using soap if necessary. Dry in a current of air.

Canvas, to Renovate.—Coat it with a black leather varnish, such as the following: Digest shellac, 12 parts; white turpentine, 5; gum sandarac, 2; lampblack, 1; with spirits of turpentine, 4; and alcohol, 96.

Carpets, to Clean.—1. If brooms are wet with boiling suds once a week, they will become very tough, will not cut a carpet, and will last much longer. A handful or so of salt sprinkled on a carpet will carry the dust along with it and make the carpet look bright and clean. A very dusty carpet may be cleaned by dipping the broom in cold water, shaking off all the drops, and sweeping a yard or so at a time. Wash the broom and repeat until the entire carpet has been swept.

2. Use 1 pint oxgall to a pailful of water; after washing apply cold water to rinse out the oxgall, and finally sponge as dry as possible.

3. *Dry Cleaning.*—Have ready a number of dry coarse cotton or linen cloths, some coarse flannels and one or more large pieces of coarse sponge; two or more hard scrubbing or scouring brushes, some large tubs or pans, and pails, and also a plentiful supply of both hot and cold water. First take out all grease spots; this may be effected in several ways. Well rub the spot with a piece of hard soap and wash out with a brush and cold water, and well dry each spot before leaving it.

4. Or use, instead of the soap, a mixture of fuller's earth, gall and water, well rinsing and drying each spot as before. When this has been done, the carpet may be cleaned by the first method mentioned.

Carpet, How to Sweep.—It is not an easy matter to sweep well, at any rate, if we may judge by experience; for when a broom is put into the hands of the uninitiated, more harm than good generally results from the use of it. Without the greatest care and some little knowledge, furniture and paint, by being knocked about with the broom, may soon receive an irreparable amount of damage. Before sweeping rooms, the floors should be strewed with a good amount of dry tea leaves, which should be saved for the purpose; these will attract the dust and save much harm to other furniture, which, as far as possible, should be covered up during the process. Tea leaves also may be used with advantage upon druggets and short piled carpets. Light sweeping and soft brooms are here desirable. Many a carpet is prematurely worn out by injudicious sweeping. Stiff carpet brooms and the stout arms of inexperienced servants are their destruction. In sweeping thick piled carpets, such as Axminster and Turkey carpets, the servant should be instructed to brush always the way of the pile; by so doing they may be kept clean for years; but if the broom is used in a different way, all the dust will enter the carpet and soon spoil it. Salt sprinkled upon the carpet before sweeping will make it look bright and clean. This is also a good preventive against moths.

To Remove Grape Stains from Carpet.—Wash out with warm soapsuds and a little ammonia water.

Carriages, to Preserve.—1. Ammonia cracks varnish and fades the colors both of painting and lining. A carriage should never, under any circumstances, be put away dirty. In washing a carriage, keep out of the sun, and have the lever end of the "setts" covered with leather. Use plenty of water, which apply (where practicable) with a hose or syringe, taking care that the water is not driven into the body to the injury of the lining. When forced water is not attainable, use for the body a large soft sponge. This, when saturated, squeeze over the panels, and by the flow down of the water the dirt will soften and harmlessly run off, then finish with a soft chamois leather and oil silk handkerchief. The same remarks apply to the under works and wheels, except that when the mud is well soaked, a soft mop, free from any hard substance in the head, may be used. Never use a "spoke brush," which, in conjunction with the grit from the road, acts like sandpaper on the varnish, scratching it, and of course effectually removing all gloss. Never allow water to dry itself on the carriage, as it invariably leaves stains. 2. Be careful to grease the bearings of the fore carriage so as to allow it to turn freely. Examine a carriage occasionally, and whenever a bolt or slip appears to be getting loose, tighten it up with a wrench, and always have little repairs done at once. Top carriages should never stand with the head down, and aprons of every kind should be frequently unfolded or they will soon spoil.

Celluloid Collars and Cuffs, to Whiten.—1. If the coloring does not disappear when the affected portions are rubbed with a woolen cloth and a little tripoli, and then polished with a clean woolen rag, the injury is a permanent one. 2. Cream of tartar is excellent. Use with a little water.

Celluloid Covered Mountings, to Clean.—Rub the covered parts with a woolen cloth and a little tripoli, and polish with a clean woolen rag.

China, to Clean.—Use a little fuller's earth and soda or pearlash with your water.

Chromos, to Clean.—Keep a wet towel lying on its face till the dirt is thoroughly softened, say 3 or 4 days, occasionally rubbing off carefully with a sponge; then rub with clear nut or linseed oil.

Clocks and Watches, to Clean.—In cleaning clock and watch movements take 1 qt. water, about 1 teaspoonful or 5 grn. liquid ammonia or alkali; into this liquid should be grated or scraped fine 5 grn. common soap. These proportions can be varied as desired, if the following remarks are kept in view: The articles to be cleaned should be plunged into this bath, where they should be allowed to remain at least ten minutes. Twenty or thirty minutes is better, especially for clocks. The articles should be wiped dry when removed from the bath, or polished up with a brush dipped in some polishing powder. Rectified benzine is preferable, as ammonia is apt to turn the movement black if in excess. Use great care in using benzine, as it is very inflammable and never should be used at night.

Cloth, Spots and Stains on. See *Spots and Stains* below.

To Clean Black Cloth.—Dissolve 1 oz. bicarbonate of ammonia in 1 qt. warm water. With this liquid rub the cloth, using a piece of flannel or black cloth for the purpose. After the application of this solution, clean the cloth well with clear water, dry and iron it, brushing the cloth from time to time in the direction of the fiber.

Cloth Cleaning Compound.—Glycerine, 1 oz.; sulphuric ether, 1 oz.; alcohol, 1 oz.; ammonia, 4 oz.; Castile soap, 1 oz.; mix together and add sufficient water to make 2 qt. Apply and rinse.

Clothes, to Brush.—Brushing clothes is a very simple but very necessary operation. Fine clothes require to be brushed lightly, and with rather a soft brush, except where mud is to be removed, when a hard one is necessary, being previously beaten lightly to dislodge the dirt. Lay the garment on a table, and brush it in the direction of the nap. Having brushed it properly, turn the sleeves back to the collar, so that the folds may come at the elbow joints; next turn the lapels or sides back over the folded sleeves, then lay the skirts over level with the collar, so that the crease may fall about the

center, and double one half over the other, so that the fold comes in the center of the back.

Coins, Medals, etc., to Clean.—1. If the coins are silver, clean with potassium cyanide. This is a deadly poison, and should be handled with care.

2. Dip in strong hot solution of potash or soda, rinse and dip for a moment in nitric acid, after which rinse quickly in running water.

3. Coins can be quickly cleansed by immersion in strong nitric acid, and immediate washing in water. If very dirty, or corroded with verdigris, it is better to give them a rubbing with the following: ½ oz. pure bichromate of potash; 1 oz. sulphuric acid; 1 oz. nitric acid. Rub over, wash with water, wipe dry, and polish with rotten stone or chalk.—*Lyle.*

Color, to Restore.—When color on a fabric has been accidentally or otherwise destroyed by acid ammonia is applied to neutralize the same, after which an application of chloroform will, in almost all cases, restore the original color. The application of ammonia is common, but that of chloroform is but little known.

Color, to Revive the Color of Faded Black Cloth or Leather.—Take of the best quality of blue galls, 4 oz.; of logwood, clean sulphate of iron, (copperas), clean iron filings and sumac leaves, each 1 oz.; put the galls, logwood and sumac berries into 1 qt. of the best white wine vinegar, and heat to nearly the boiling point in a sand bath, then add the iron filings and copperas; digest for twenty-four hours and strain for use. Apply with a sponge.

Combs, to Clean.—If it can be avoided, never wash combs, as the water often makes the teeth split and the tortoiseshell or horn of which they are made rough. Small brushes, manufactured purposely for cleaning combs, may be purchased at a trifling cost; with this the comb should be well brushed, and afterward wiped with a cloth or towel.

Copper, to Clean.—1. Take 1 oz. of oxalic acid, 6 oz. rottenstone, ½ oz. gum arabic, all in powder, 1 oz. sweet oil, and sufficient of water to make a paste. Apply a small portion, and rub dry with a flannel or leather.

2. Use soft soap and rotten stone, made into a stiff paste with water, and dissolved by gently simmering in a water bath. Rub on with a woolen rag, and polish with dry whiting and rotten stone. Finish with a leather and dry whiting.

3. Copper plates are cleaned by laying them on the hob near the fire, and pouring on them some turpentine, and then rubbing them with a small soft brush.

Coral, to Clean and Bleach.—1. The secret in cleaning coral is to turn the mass bottom upward and suspend it by means of a piece of wire in the saucepan, so that the dirt, as it boils off, may drop into the water, instead of down the septa. A strong solution of ordinary washing soda, or better, oxalic acid, is to be used to boil in it. The mass is to be boiled at least three hours. This is not only to clean the coral, but to bleach it also.

2. Apply a mixture of hydrochloric acid and water, or wash the coral with a stiff brush in cold salt and water, with a little soap powder, a little chloride of lime will improve it, then put in the sun to dry and bleach.

Crape, to Restore.—Skimmed milk and water, with a little bit of glue in it, made scalding hot, is excellent to restore rusty Italian crape. If clapped and pulled dry like muslin, it will look as good as new; or, brush the veil till all the dust is removed, then fold it lengthwise, and roll it smoothly and tightly on a roller. Steam it till it is thoroughly dampened, and dry on the roller.

Crape, to Clean.—Crape is cleansed by rinsing it in ox-gall and water, to remove the dirt, afterward in pure water to remove the gall, and lastly in a little gum water to stiffen and crisp it. It is then clapped between the hands until dry.

Curtains, to Wash.—Shake every curtain, or hang them on a line and brush them down with a soft haired brush. Prepare a soaking liquid by melting a small quantity of borax in warm water, soak for an hour or two, then squeeze between the hands to remove the superfluous water. Take some good soap and chip it in hot water, stir until all the soap is melted, and a fine lather produced. By this time the water will be moderately warm. Immerse the curtains in this, pass them repeatedly through the lathered water, or work them up and down. Rubbing should be avoided; when absolutely necessary, do it gently and without a brush. Squeeze out the soapy water, and rinse in plenty of soft, warm water. Wring carefully. Curtains should be dried quickly. If in the country, they may be spread to dry on clean grass. Otherwise curtains are always better for being stretched and pinned to wooden frames while drying.

It is advisable to use cooked starch for curtains. Use good starch, mix it thoroughly in warm water, which should be made to boil for fifteen or twenty minutes. While cooling add a very little indigo blue. This is only to be used for pure white curtains. The starch should be decidedly thick. Draw the curtains through the starch, squeeze out gently, and dry rapidly.

Curtains, Coloring. — Many persons prefer tinted curtains to pure white ones. If they have to be colored, do not put any blue in the starch, but use water that has been slightly tinted with coffee (for ecru curtains), tea for a more decided hue, or saffron (for yellow tint) for preparing the starch. A decoction of logwood may be used if you wish to give the curtains a delicate pink hue.

Curtains, how to Prepare Special Coloring Starches for Curtains.—The basis of these coloring starches is thus prepared. Soak 1 lb. of good white glue for twelve hours, using just enough water to make it into a jelly; dissolve this with boiling water, adding about 18 to 19 lb. of Paris white; add more water until the compound is diluted to the consistency of milk. This starch may be colored to taste. A little Prussian blue and vermilion (in the proportions of 2 to 1) gives a fine lilac. Raw umber and a pinch of lamp-black gives a gray. Vermilion and red lead (in the proportion of 3 to 1) produce a tender rose. Indigo blue just tinted with vermilion gives a lavender. Chrome yellow and a pinch of Spanish brown gives lemon yellow. Indian yellow and burnt sienna (in the proportion of 2 to 1) gives a buff hue. Experiments should be tried, as some of the colors look very badly if they are dark.

Diamonds, to Clean.—Clean all diamonds and precious stones by washing them with soap and water with a soft brush, adding a little ammonia in the water, and then dry in fine boxwood sawdust. A little potash or pearlash put in the water will answer the same purpose.

Drawing Instruments, to Clean.—If the lacquering is badly spotted, clean it off with strong alcohol, and then polish the brass or German silver with the following paste by means of flannel and a little water, and polish off with clean chamois leather or cotton cloth and a little whiting, after which you might re-varnish with shellac dissolved in alcohol, colored with a little dragon's blood, which can be got from any apothecary: Soft soap, 3 oz.; sweet oil, ½ oz.; turpentine, ¼ oz.; powdered rotten stone, 4 oz.; finest flour emery, 1 oz.; fine powdered crocus of antimony, ½ oz. Melt the soap, oil and turpentine together, add the powders, a little water to make a stiff paste, and mix well.

Engravings, to Clean.—1. Presuming these to be mounted, proceed in the following manner: Cut a stale loaf in half, with a perfectly clean knife; pare the crust away from the edges. Place the engravings on a flat table, and rub bing the surface with the fresh cut bread, in circular sweeps, lightly but firmly performed, will remove all superficial markings. Soak the

prints for a short time in a dilute solution of hydrochloric acid, say 1 part acid to 100 of water, and then remove them into a vessel containing a sufficient quantity of clear chloride of lime water to cover them. Leave them here until bleached to the desired point. Remove, rinse well by allowing to stand an hour in a pan in which a constant stream of water is allowed to flow, and finally dry off by spreading on clean cloths. Perhaps they may require ironing between two sheets of clean paper.

2. Put the engraving on a smooth board, cover it thinly with common salt finely powdered; squeeze lemon juice upon the salt so as to dissolve a considerable proportion of it; elevate one end of the board, so that it may form an angle of about 45° or 50° with the horizon. Pour on the engraving boiling water from a tea kettle until the salt and lemon juice be all washed off; the engraving will then be perfectly clean, and free from stains. It must be dried on the board, or on some smooth surface, gradually. If dried by the fire or the sun, it will be tinged with a yellow color.

3. Hydrochloric acid, oxalic acid, or eau de Javelle may be employed, weakened by water. After the leaves (if it be a book) have by this means been whitened, they must be bathed again in a solution of sulphate of soda, which will remove all the chlorine, and leave the leaves white and clean. They will, however, have lost all firmness of texture, owing to the removal of the size from the paper. It will, therefore, be advisable to give a bath of gelatine and alum made with boiling water, to which may be added a little tobacco, or any other simple substance, to restore the tint of the now too white paper.

4. Immerse each mildewed sheet separately in a solution made in the proportions of ½ lb. chloride of lime to 1 pt. of water. Let it stand, with frequent stirring, for 24 hours, and then strain through muslin, and finally add 1 qt. water. Mildew and other stains will be found to disappear very quickly, and the sheets must then be passed separately through clear water, or the chloride of lime, if left in the paper, will cause it to rot. Old prints, engravings, and every description of printed matter may be successfully treated in the same manner.

5. "I have in my time cleaned many hundreds. The plan which I adopt is as follows: I place them, one or two at a time, in a shallow dish, and pour water over them until they are completely soaked or saturated with it. I then carefully pour off the water, and pour *on* to the prints a solution of chloride of lime (1 part liquor calcis chloratæ to 39 parts of water). As a general rule, the stains disappear as if by magic, but occasionally they are obstinate. When that is the case, I pour on the spot pure liquor calcis chloratæ, and if that does not succeed, I add a little dilute nitro-muriatic acid. I have never had a print which has not succumbed to this treatment—in fact, as a rule, they become too white. As soon as they are clean they must be carefully washed with successive portions of water until the whole of the chlorine is got rid of. They should then be placed in a very weak solution of isinglass or glue, and many collectors color this solution with coffee grounds, etc., to give a yellow tint to the print. They should be dried between folds of blotting paper, either in a press or under a heavy book, and finally ironed with an ordinary flat iron to restore the gloss, placing clean paper between the iron and the print. Grease stains are much more difficult. I find benzine best. Small grease spots may be removed by powdered French chalk being placed over them, a piece of clean blotting paper over the chalk, and a hot iron over that."—*F. Andrews.*

6. Mildew often arises from the paste used to attach the print. Take a solution of alum of medium strength and brush on back and face of the engraving 2 or 3 coats, then make the frame air-tight by pasting a strip of paper all round the inside of glass, leaving about ½ in. overlapping (taking care not to paste the paper on the glass so as to be seen from the front), then place your glass in frame, take the overlapping piece and paste to side of rabbet; place your picture in position, spring back board in, and then place a sheet of strong paper (brown) on the table, damp it, and paste round back of frame, lay it on to the paper, leave to dry, cut level. If this does not answer, there will be no help for it, but dust off as the mould accumulates. Do not brush on surface with the alum if the engraving is colored, but several coats on the back.

7. It has been found that ozone bleaches paper perfectly without injuring the fiber in the least. It can be used for removing mildew and other stains from engravings that have been injured by hanging on the walls of damp rooms. The engraving should be carefully moistened and suspended in a large vessel partially filled with ozone. The ozone may be generated by putting pieces of clean phosphorus in the bottom of the vessel partially covered with water; or by passing electric sparks through the air in the vessel.

8. If the engravings are very dirty, take two parts of common salt and one part common soda, and pound them together until very fine. Lay the engraving on a board, and fasten it with drawing pins, and then spread the mixture dry equally over the surface to be cleaned. Moisten the whole with warm water and a little lemon juice, and, after it has remained about a minute, or even less, tilt the board up on its end, and pour over it a kettleful of boiling water, being careful to remove all the mixture, and avoid rubbing. If the engraving is not very dirty, the less soda used the better, as it has a tendency to give the engraving a yellow hue.

Emery, to Cleanse after Using.—Boil with caustic potash, stirring constantly, then wash with acid, dilute and dry.

To Remove Grease from Emery Wheels.—Wash with bisulphide of carbon.

Lightning Eradicator.—Strong ammonia water, 4 oz.; water, 2 qts.; saltpeter, 1 oz.; mottled soap, 2 oz.; the soap must be finely shaved. Mix thoroughly and allow the preparation to stand for several days before using. Cover any grease spot with this preparation, rub well and rinse with clean water.

Feathers, to Clean.—1. To clean feathers from their own animal oil, steep them in 1 gal. of water mixed with 1 lb. of lime, stir them well, and then pour off the water, and rinse the feathers in cold spring water. To clean feathers from dirt, simply wash them in hot water with soap. Rinse them in hot water.

2. To Clean White Ostrich Feathers.—4 oz. white curd soap cut small, dissolved in 4 pt. water, rather hot, in a basin. Make the solution into a lather by beating it with birch rods or wires. Introduce the feathers and rub well with the hands for five or six minutes. After the soaping, wash in clean water as hot as the hand can bear. Shake until dry.

3. Slightly soften the soiled feathers with warm water, using a camel's hair brush. Next raise each feather with a flat piece of wood or paper knife, and clean them with spirits of wine. Dry with plaster of Paris, and afterward brush them carefully with a dry camel's hair brush,

4. Make a strong solution of salt in water, saturate a large and thick cloth with it. Wrap the bird up in the damp cloth in as many folds as you can, not disarranging the plumage. Look at the bird in six hours, and if not long dried on the blood will be soft; if not soft, keep it in the cloth longer, and rewet it. When soft, rub out with gentle pressure, putting something hard under each feather with blood on, and rubbing with the back of a knife. Of course each feather must be done separately.

5. Col. Wragge treated the soiled plumage of albatrosses, Cape petrel, etc., by simply washing the feathers in rain water, after the process of skinning, and then laying a thick mixture of starch and water over the portion to be cleansed. Next he laid the birds aside, and left them till the plastering of starch had become thoroughly dry. He then removed the dry plaster by tapping it, and found that the feathers had become much cleaner. Old specimens may be cleaned in this way. Feathers may be set by just arranging them naturally with a needle or any pointed instrument.

6. White.—Dissolve 4 oz. of white soap in 2 qt. of boiling water, put it into a large basin or small pan, and beat to a strong lather with a wire egg beater or a small bundle of birch twigs; use while warm. Hold the feather by the quill with the left hand, dip it into the soap liquor and squeeze it through the right hand, using a moderate degree of pressure. Continue this operation until the feather is perfectly clean and white, using a second lot of soap liquor if necessary. Rinse in clean hot water to take out the soap, and afterward in cold water in which a small quantity of blue has been dissolved. Shake well, and dry before a moderate fire, shaking it occasionally, that it may look full and soft when dried. Before it is quite dry, curl each fiber separately with a blunt knife or ivory paper folder.

To Purify Feathers for Beds, Pillows, etc.—Prepare a quantity of lime water in the following manner: Well mix 1 lb. of quicklime in each gal. of water required, and let it stand until all the undissolved lime is precipitated, as a fine powder, to the bottom of the tub or pan, then pour off the clear liquor for use. The number of gallons to be prepared will, of course, depend on the quantity of feathers to be cleaned. Put the feathers into a clean tub, pour the lime water on them, and well stir them in it until they all sink to the bottom. There should then be sufficient of the lime water to cover them to a depth of 3 in. Let them stand in this for three or four days, then take them out, drain them in a sieve, and afterward well wash and rinse them in clean water. Dry on nets having a mesh about the same size as a cabbage net; shake the net occasionally, and the dry feathers will fall through. When they are dried, beat them well to get rid of the dust. It will take about three weeks to clean and dry a sufficient quantity for a bed. This process was awarded the prize offered by the Society of Arts.

To Render Feathers White and to Remove the Gray Color.—Feathers must be cleansed by immersing for a short time in naphtha or benzine. Rinse in a second dish of the same and dry in the air. Then bleach by exposing in a box to the vapor of burning sulphur in a moist atmosphere.

Flannels, to Wash.—Shave a little white soap into a pail, and pour on it water nearly boiling hot to dissolve it, adding, if you choose, a tablespoonful of spirits of ammonia. Pour the hot suds upon the flannels in a tub, and use a good pounder or a machine, as the water needs to be of too high a temperature for the hands. Wring the flannels, and put them into a second water, like the first, except with less soap, and use again the pounder or machine. Rub the soiled spots in the suds as hot as you can bear, but never rub soap on the spots. Wring the flannels as dry as you can with a good wringer, and put them on a line in a brisk, drying air. The hotter they are when wrung and the sooner they dry the better. Their color may be improved by a little bluing; and if they are well ironed before getting quite dry, fulling is prevented.

Flannel Shrinking.—All flannel ought properly to be shrunk before it is cut out and made up into garments. The process is quite simple. Soak the flannel for a few minutes in warm water, then rub some good laundry soap over every inch of it, dip it in the water and knead it, or shake it up and down; do not scrub. After the washing, let the flannel be thoroughly rinsed in warm water. It must be remembered that boiling or hot water should never touch flannel. Wring carefully and dry slowly. On no account allow flannel to be dried in an overheated drying closet or before a fire.

Flannel Washing.—To wash flannel or flannel garments, prepare a good lather in hot water; when just warm throw in your flannel and work it up and down, backward and forward. Scrubbing must be avoided, and no soap should be actually rubbed on it, as this will induce further shrinkage. Rinse in warm water, twice if necessary. Never wash or rinse in hot or cold water, as they both cause the flannel to shrink suddenly.

Flannel Blankets, to Wash.—Put the soiled blankets to soak for fifteen minutes in plain soft warm water. Prepare a soft jelly with first class laundry soap and boiling water, 1 lb. of soap for every blanket. Pour this into a tub of warm water, let it melt and lather it up well with the hand. Wring the blankets from the soaking tub, and throw them into the lather; stir them about and leave to soak ten minutes, then hand rub every inch of the blankets, paying especial attention to stains. Take them out and wring, then rinse in warm water twice. Dry well, but do not expose them to great heat. When dry stretch them in every direction, and rub all over with a piece of clean rough flannel. This makes them fluffy and soft. If very dirty, a little borax may be added to the water, but no soda or bleaching powder should ever be used.

Flannels, to Iron.—Most flannels are the better for not being ironed, but in some cases it is necessary to do so. The proper way is to dry the flannels, then spread them on an ironing board, cover them with a slightly damp cloth, and iron over this, pressing down heavily. The iron must not be too hot.

Fleckenwasser.—(Bronner.) Cleansing fluid (literally spot or stain water) for the removal of grease and dirt spots. Benzine only.

Fleckenwasser Englisches.—English cleansing fluid for removing acid, resin, wax, tar, and grease spots. A mixture of 95% alcohol, 100 grm.; liq. ammon., sp. gr. 875, 30 grm.; benzine, 4 grm.—*Artus.*

Floors, to Scour.—Clean sand, 12 parts; soft soap, 8 parts; lime, 4 parts. Use a scrubbing brush and rinse.

Fly Specks, to Remove from Brass, etc.—If you cannot wash off the fly specks with soap and warm water on a cloth, there is no way that an amateur can refinish lampwork with any satisfaction. To do this, the lamp must be taken apart and the brasswork boiled in caustic soda to remove all oil and varnish; then rinse in hot water and dip in strong nitric acid for a few seconds only, when it will come out clean and bright; then rinse clean in boiling water. Dry in sawdust, brush off, and lacquer with thin shellac varnish. The metal must be warm and perfectly free from grease.

Fly Specks from Bronze, to Remove.—Lavender oil, 1 drm.; alcohol, 1 oz.; water, 1½ oz. Use a soft sponge and proceed quickly with little rubbing.

Fly Specks, to Remove from Gilding.—Old ale is a good thing to wash any gilding with, as it acts at once on the fly dirt. Apply it with a soft rag.

Frames, to Renovate.—You may improve them by simply washing them with a small sponge moistened with spirits of wine or oil of turpentine, the sponge only to be sufficiently wet to take off the dirt and fly marks. They should not be wiped afterward, but left to dry of themselves.

Fruit and Wine Stains.—1. White cotton or linen, fumes of burning sulphur, warm chlorine water. Colored cottons or woolens, wash with tepid soapsuds of ammonia. Silks the same, with very gentle rubbing.

2. First rub the spot on each side with hard soap and then lay on a thick mixture of starch and cold water. Rub this mixture of starch well into the spot, and afterward expose it to the sun and air. If the stain has not disappeared at the end of three or four days, repeat the process.

3. Stains of wine may be quickly and easily removed from linen, by dipping the parts which are stained into boiling milk. The milk to be kept boiling until the stain disappears.

4. Most fruits yield juices which, owing to the acid they contain, permanently injure the tone of the dye; but the greater part may be removed without leaving a stain, if the spot be rinsed in cold water in which a few drops of aqua ammonia have been placed, before the spot has dried. Wine stains on white materials may be removed by rinsing with cold water, applying locally weak solution chloride of lime, and again rinsing in an abundance of water. Some fruit stains yield only to soaping with the hand, followed by fumigation with sulphurous acid; but the latter process is inadmissible with certain colored stuffs. If delicate colors are injured by soapy or alkaline matters, the stains must be treated with colorless vinegar of moderate strength.

5. To remove fruit and wine stains from table linen moisten with dilute sulphuric acid and then rub with aqueous solution of sulphite or hyposulphite of soda in water.

6. Spread the stained part over a bowl or basin, and pour boiling water through it; or rub on salts of lemon and pour boiling water through until the stain disappears or becomes very faint.

Furniture, how to Improve the Appearance of.—Mr. G. J. Henkels, of Philadelphia, Pa., suggests that when the polish on new furniture becomes dull it can be renewed by the following process: Take a soft sponge, wet with clean cold water, and wash over the article. Then take a soft chamois skin and wipe it clean. Dry the skin as well as you can by wringing it in the hands, and wipe the water off the furniture, being careful to wipe only one way. Never use a dry chamois on varnished work. If the varnish is defaced and shows white marks, take linseed oil and turpentine in equal parts; shake them well in a phial and apply a very small quantity on a soft rag until the color is restored; then with a clean soft rag wipe the mixture entirely off. In deeply carved work the dust cannot be removed with a sponge. Use a stiff haired paint brush instead of a sponge. The cause of varnished furniture becoming dull, and the reason why oil and turpentine restore its former polish, it will be appropriate to explain. The humidity of the atmosphere and the action of gas cause a bluish white coating to collect on all furniture, and show conspicuously on bright polished surfaces, such as mirrors, pianos, cabinet ware, and polished metal. It is easily removed as previously directed. The white scratches on furniture are caused by bruising the gum of which varnish is made. Copal varnish is composed of gum copal, linseed oil, and turpentine or benzine. Copal is not soluble in alcohol, as other gums are, but is dissolved by heat. It is the foundation of varnish, as the oil is used only to make the gum tough, and the turpentine is required only to hold the other parts in a liquid state, and it evaporates immediately after its application to furniture. The gum then becomes hard and admits of a fine polish. Thus, when the varnish is bruised, it is the gum that turns white, and the color is restored by applying the oil and turpentine. If the mixture is left on the furniture, it will amalgamate with the varnish and become tough. Therefore the necessity of wiping it entirely off at once. To varnish old furniture, it should be rubbed with pulverized pumice stone and water to take off the old surface, and then varnish with varnish reduced, by adding turpentine, to the consistency of cream. Apply with a stiff haired brush. If it does not look well, repeat the rubbing with pumice stone, and when dry, varnish it again.

For a crack, a worm eaten hole, or a deep flaw, prepare the proper dust, by the admixture of brick dust in flour (also kept ready), or whiting or ocher, or any required tint. Then take well cooked glue, and on a house plate stir it in slowly while hot, with sufficient powder for your work. Dab the hole or crack with your glue brush, then with a putty knife stir about the mixture on the plate, taking care you have the right color. When sure on this point, take some of the cement on the end of the knife and insert it in the desired place. Then use as much pressure as you possibly can with the blade, and keep smoothing at it. Sprinkle a little of the dry powder on the spot. When thoroughly dry, sand paper the surface with an old used piece, so as not to abrade the joint. You can then varnish the mending. Where weevil and wood worms have devoured the furniture, cautiously cut out the part till a sound place be reached. Poison the wood with a solution of sulphate of copper injected into the hollow. Let it dry. Cut an angular piece of same wood from your board, and with a sharp chisel make a suitable aperture for its reception. Fix it with glue. When thoroughly dry, work with carving tools or rasp and glass, scraping till the new bit of work exactly matches the old.

Polish for Removing Stains from Furniture.—1 pt. of 98% alcohol, ground resin ½ oz., gum shellac 1½ oz. After the resin and shellac cut in the alcohol, mix in 1 pt. of linseed oil, and give the whole a good shaking. Apply with a cloth or newspaper, and polish with a flannel after applying the solution.

Furs, to Clean Dark.—Sable, chinchilla, squirrel, fitch, etc. Heat a quantity of new bran in a pan, taking care that it does not burn, stir constantly. When well heated rub thoroughly into the fur. Repeat two or three times. Shake the fur and brush briskly until free from dust.

Furs, to Clean Light.—White furs, ermine, etc., may be cleaned in the following way: Lay the fur on a table and rub with bran, moistened with warm water. Rub until dry, then rub with dry bran. Use flannel for rubbing with the wet bran and book muslin for the dry. After using the bran, rub with magnesia. Dry flour may be used instead of wet bran. Rub against the way of the fur.

Gilt Picture Frames, to Clean.—1. Fly marks can be cleaned off with soap and water used sparingly on end of finger covered by piece of rag. When all cleared off, rinse with cold water, and dry with chamois leather; next buy a pound of common size and two penny paint pans. Boil a little of the size in one of the pans with as much water as will just cover it. When boiled, strain through muslin into clean pan, and apply thinly to frames with camel hair brush (called technically a "dabber"). Take care you do not give the frames too much water and "elbow grease." On no account use gold size, as it is used only in regilding, and if put on over the gold would make it dull and sticky.

2. Dissolve a very small quantity of salts of tartar in a wine bottle of water, and with a piece of cotton wool soaked in the liquid dab the frames very gently, no rubbing on any account or you will take off the gilt, then stand up the frames so that water will drain away from them conveniently, and syringe them with clean water. Care must be taken that the solution is not too strong.

3. If new gold frames are varnished with the best copal varnish it improves their appearance considerably, and fly marks can then be washed off carefully with a sponge. The frames also last many times longer. It also improves old frames to varnish them with it.

4. Gilt frames may be cleaned by simply washing them with a small sponge, moistened

with hot spirits of wine or oil of turpentine, the sponge only to be sufficiently wet to take off the dirt and fly marks. They should not afterward be wiped, but left to dry of themselves.

5. Old ale is a good thing to wash any gilding with, as it acts at once upon the fly dirt. Apply it with a soft rag; but for the ins and outs of carved work, a brush is necessary; wipe it nearly dry, and don't apply any water. Thus will you leave a thin coat of the glutinous isinglass of the finings on the face of the work, which will prevent the following flies' faeces from fastening to the frame, as they otherwise would do.

Gilt Mountings, to Clean.—Gilt mountings, unless carefully cleaned, soon lose their luster. They should not be rubbed; if slightly tarnished, wipe them off with a piece of Canton flannel, or, what is better, remove them if possible, and wash in a solution of ½ oz. of borax dissolved in 1 lb. of water, and dry them with a soft linen rag; their luster may be improved by heating them a little and rubbing with a piece of Canton flannel.

Glass Cleaning Preparation.—Photographers will find the following a useful glass-cleaning preparation: Water, 1 pt.; sulphuric acid, ½ oz.; bichromate of potash, ½ oz. The glass plates, varnished or otherwise, are left for 10 or 12 hours, or as much longer as desired, in this solution, then rinsed in clean water and wiped dry with soft white paper. The liquid quickly removes silver stains from the skin without any of the attendant dangers of cyanide of potassium.

Glass, to Clean.—1. To clean glass in frames, when the latter are covered or otherwise so finished that water cannot be used, moisten tripoli with brandy, rub it on the glass while moist, and when dry rub off with a silk rag; to prevent the mixture injuring the cloth on the frame, use strips of tin bent to an angle; set these on the frame with one edge on the glass; when the frames are of a character that will not be injured by water, rub the glass with water containing a little liquid ammonia and polish with moist paper.

2. Glass Bottles.—If vessels are oily or otherwise greasy, they should not be washed with water, but wiped with dry tow, or a dry dirty cloth, so as to remove as much grease as possible. By changing the cloth for one that is clean, the vessel can be wiped until all traces of grease disappear.

3. A strong solution of an alkali such as pearl-ash may be used, whereby the removal of the grease is materially facilitated.

4. If a vessel be soiled by resin, turpentine, resinous varnishes, etc., it should be washed with a strong alkaline solution, and rubbed by means of the wire and tow.

5. If the alkali fail to act, a little sulphuric acid may be employed with advantage. The latter acid will also be found advantageous in removing pitch and tar from vessels of glass. Nitric or sulphuric acids may be employed to clean flasks which have contained oil.

6. A correspondent of the *Philadelphia Photographer* says: "To clean a silver bottle, pour in a strong solution of cyanide; shake a few times, pour out, and rinse with water two or three times, and your bottle is perfectly clean. Keep the solution, and filter and strengthen when required. By doing this you can sun your bath better in two hours than in a week's exposure in the dirty black bottles photographers appear to delight in."

7. It would be easy for a practical brush maker to construct a brush in the form of a hollow cone, which would reach the bottom of bottles; but the difficulty would be to get it into the bottle without spoiling it (the brush). A brush composed of a single bundle of long hairs, something like a painter's sash tool, with the bristles cut somewhat tapering, should answer the purpose. The bottle must, of course, be turned round with the hand, to bring every part into contact with the brush.

8. Lead shot, where so used, often leave carbonate of lead on the internal surface, and this is apt to be dissolved in the wine or other liquids afterward introduced, with poisonous results; and particles of the shot are sometimes inadvertently left in the bottle. Fordos states that clippings of iron wire are a better means of rinsing. They are easily had, and the cleaning is rapid and complete. The iron is attacked by the oxygen of the air, but the ferruginous compound does not attach to the side of the bottle, and is easily removed in washing. Besides, a little oxidized iron is not injurious to health. Fordos found that the small traces of iron left had no apparent effect on the color of red wines; it had on white wines, but very little; but he thinks it might be better to use clippings of tin for the latter.

9. Take a small piece of the very finest and softest flannel without crease or seam, or a few inches of superfine broadcloth, dip this in powder blue, and with it clean your plate glass, polishing with a rag of soft silk or fine chamois leather.

Glassware, Laboratory, to Cleanse.—Laboratory flasks which have contained oil or fatty matter may be easily cleansed by a solution of permanganate of potassa. To remove turpentine, petroleum, photogene, etc., wash with an ounce or so of sulphuric acid and rinse with water.

To Clean Discolored Glass.—Apply dilute nitric acid. Water of ammonia is also good.

Gloves, to Clean.—Ganteine.—A composition used to clean kid and other leather gloves. 1. Curd soap (in small shavings), 1 part; water, 3 parts; mix with heat, and stir in essence of citron, 1 part.—*M. Buhan.*

2. Saponine.—Duvignau soap in powder, 256 parts; water, 155 parts; dissolve with heat, cool, and add of *eau de Javelle*, 165 parts; solution of ammonia, 10 parts; and rub the whole to a smooth paste. A small portion of either of the above is rubbed over the glove with a piece of flannel (always in one direction) until it is sufficiently clean.

Kid Gloves, to Clean.—1. Put them together with a sufficient quantity of pure benzine in a large stoppered vessel, and shake the whole occasionally, with alternate rest. If, on removing the gloves, there remain any spots, rub them out with a soft cloth moistened with ether or benzole. Dry the gloves by exposure to the air, and then place smoothly between glass plates at the temperature of boiling water until the last traces of benzine are expelled. They may then be folded and pressed between paper with a warm iron. Another way is to use a strong solution of pure soap in hot milk beaten up with the yelk of one egg to a pint of the solution. Put the glove on the hand, and rub it gently with the paste, to which a little ether may be added, then carefully lay by to dry. White gloves are not discolored by this treatment, and the leather will be made thereby clean and soft as when new.

2. Damp them slightly, stretch them gently over a wooden hand of appropriate size, and clean them with a sponge dipped in benzole, recently rectified oil of turpentine, or camphine. As soon as they are dry, withdraw them gently from the stretcher, and suspend them in a current of air for a few days, or until they cease to smell of the cleaning liquid used. Heat must be avoided. The cleaning liquid should be used liberally, and the first dirty portion should be sponged off with clean liquid.

3. Make a strong lather with curd soap and warm water; lay the glove flat on a board, the bottom of a dish, or other unyielding surface; dip a piece of flannel in the lather, and well rub the glove with it till all the dirt is out, turning it about so as to clean it all over. Dry in the sun or before a moderate fire. When dry they

will look like old parchment, and should be gradually pulled out and stretched.

4. Have a small quantity of milk in a cup or saucer, and a piece of brown Windsor or glycerine soap in another saucer. Fold a clean towel or other cloth three or four times thick, and spread the glove smoothly on the cloth. Dip a piece of flannel in the milk, and rub it well on the soap. Hold the glove firmly with the left hand, and rub it with the flannel toward the fingers. Continue this operation until the glove, if white, appears of a dirty yellow; or if colored, until it looks dirty and spoiled, and then lay it to dry. Gloves cleaned by this method will be soft, glossy and elastic.

5. French Method.—Put the gloves on your hands, and wash them in spirits of turpentine until they are quite clean, rubbing them exactly as if washing your hands; when finished, hang them in a current of air to dry and to take off the smell of the turpentine.

6. Eau de Javelle, 135 parts; ammonia, 8 parts; powdered soap, 200 parts; water, 150 parts. Make a soft paste, and use with a flannel.

7. Wash them with soap and water; then stretch them on wooden hands, or pull them into shape without wringing them; next rub them with pipe clay or yellow ocher, or a mixture of the two in any required shade, made into a paste with beer; let them dry gradually, and when about half dry rub them well, so as to smooth them and put them into shape; then dry them, brush out the superfluous color, cover them with paper, and smooth them with a warm iron. Other colors may be employed to mix with the pipe clay besides yellow ocher.

Glove Cleaner.– Castile soap, white, 3 troy oz.; Javelle water, 2 fl. oz.; water, 2 fl. oz.; water of ammonia, 1 drm. Dissolve the soap by the aid of heat in the water, and when nearly cold, add the Javelle water and the water of ammonia. The preparation should form a paste, to be rubbed on the soiled part of the glove with a piece of flannel. This receipt is in use in many large cleaning establishments, and can be recommended.

Kid Gloves, to Clean without Wetting.—1. Stale bread is sometimes used for this purpose. The gloves are put on and the softer part of the bread is broken up into crumbs and the hands are rubbed one over the other as in the act of washing, the crumbs being thus rubbed over all parts of the gloves. Spongy rubber is often used for glove cleaning. It is applied in the same manner as in cleaning drawings, *i. e.*, it is rubbed over the soiled parts of the glove.

2. Lay the gloves upon a clean board, make a mixture of dried fuller's earth and powdered alum, and pass them over on each side with a stiff brush. Then sweep the dust off and sprinkle them well with dry bran and whiting and dust them well. This, if the gloves be not exceedingly soiled, will effectually cleanse them; but if they are much soiled, take out the grease with crumbs of toasted bread and powder of burnt bone, then pass them over with a woolen cloth, dipped in fuller's earth or powdered alum.

Doeskin, Wash Leather (Chamois), and Undressed Kid.—1. Wash them in lukewarm soft water, with a little Castile or curd soap, oxgall or bran tea; then stretch them on wooden hands, or pull them into shape without wringing them; next rub them with pipe clay, yellow ocher, or umber, or a mixture of them in any required shade, made into a paste with ale or beer; let them dry gradually, and when about half dry rub them well, so as to smooth them, and put them into shape; when they are dry brush out the superfluous color, cover them with paper and smooth them with a warm (not hot) iron.

2. Take out the grease spots by rubbing them with magnesia or with cream of tartar. Then wash them with soap dissolved in water as directed for kid gloves, and afterward rinse them, first in warm water and then in cold. Dry in the sun, or before the fire. All gloves are better and more shapely if dried on glove trees or wooden hands.

3. Stretch them on a hand or lay them flat on a table, and rub into them a mixture of finely powdered fuller's earth and alum; sweep it off with a brush, sprinkle them with a mixture of dry bran and whiting, and lastly dust them off well. This will not do if they are very dirty.

Gold Bronze, to Clean.—Boil in a weak alkali prepared from an infusion of wood ashes. Then clean with a solution composed of equal parts nitric acid, water and alum.

Gold Detergent.—(Upton.) Quicklime, 1 oz.; sprinkle it with a little hot water to slake it, then gradually add 1 pt. boiling water, so as to form a milk. Next dissolve pearlash, 2 oz., in boiling water, 1½ pt. Mix the two solutions, cover up the vessel, agitate occasionally for an hour, allow it to settle; decant the clear, put it into flat ½ pt. bottles, and cork them well. Use to clean gilding either alone or diluted with water. It is applied with a soft sponge, and then washed off with clean water. It is essentially a weak solution of potassa and may be extemporaneously prepared by diluting solution of potassa with about five times its volume.

Gold, Cleaning Dull.—A solution of 80 grm. chloride of lime, 80 grm. bicarbonate of soda, and 20 grm. common salt in 3 liters distilled water is prepared and kept in well-closed bottles. The article to be cleaned is allowed to remain some short time in this solution (which is only to be heated in the case of very obstinate dirt), then taken out, washed with spirit, and dried in sawdust.

Gold and Silver, Removing Stains from.—Immerse for some time in a solution of ½ oz. cyanide of potassium to 1 pt. rain water, and brush off with prepared chalk.

Gold Lace, to Wash. — It is placed overnight in urine or wine and washed. Take 1½ pt. water and 1½ pt. whisky, and a little ground gum arabic and saffron. Apply with a brush when the laces are stretched on a table.

Granite, Removal of Stains from.—1. A paste of 1 oz. oxgall, 1 gill of strong solution of caustic soda, 1½ tablespoonful of turpentine, with enough pipe clay to make it thick and consistent, scour well.

2. Mix together ¼ lb. whiting, ¼ lb. soft soap, 1 oz. washing soda, and a piece of sulphate of soda as big as a walnut. Rub it over the surface you propose to treat, let it stand twenty-four hours, and then wash off. If it succeeds, try another portion.

3. Smoke and soot stains can be removed with a hard scrubbing brush and fine sharp sand, to which add a little potash.

4. Use strong lye, or make a hot solution of 3 lb. of common washing soda dissolved in 1 gal. of water. Lay it on the granite with a paint brush.

Grass Stains, to Remove.—Wash the stained places in clean, cold, soft water, without soap, before the garment is otherwise wet.

Grease, Removal of.—1. It is impossible to classify all the receipts under this heading. Many additional ones will be found under Spots and Stains below, others under Oil Stains.

2. Fatty oils have a greater surface tension than oil of turpentine, benzole or ether. Hence, if a grease spot on a piece of cloth be moistened on the reverse side with one of these solvents, the tension on the greasy side is larger, and therefore the mixture of benzole and fat or grease will tend to move toward the main grease spot. If we were to moisten the center of this spot with benzole, we should not remove it, but drive the grease upon the clean portion of the cloth. It is, therefore, necessary to distribute the benzole first over a circle surrounding the grease spot, to approach the latter gradually, at the same time having

blotting paper in contact with the spot to absorb the fat immediately.

3. Another method, namely, to apply a hot iron on one side, while blotting paper is applied to the other, depends upon the fact that the surface tension of a substance diminishes with a rise of temperature. If, therefore, the temperature at different portions or sides of the cloth is different, the fat acquires a tendency to move from the hotter parts toward the cooler.—*The Pharmacist.*

4. Grease and Oil.—For white linen or cotton goods, use soap or weak lye. For colored calicoes, warm soapsuds. For woolens, soapsuds or ammonia. For silks, benzine, ether, ammonia, magnesia, chalk, yelk of egg, with water.

5. Dissolve 1 oz. pearlash in 1 pt. water, and to this solution add a lemon cut into thin slices. Mix well, and keep the mixture in a warm state for two days, then strain and bottle the clear liquid for use. A small quantity of this mixture poured on stains, occasioned by either grease, oil or pitch, will speedily remove them. Afterward wash in clear water.

6. Carbonate of magnesia—magnesia that has been previously calcined is best—is dried in an oven and mixed with sufficient benzine to form a soft, friable mass. In this state it is put into a wide mouthed glass bottle, well stoppered and kept for use. It is spread pretty thickly over the stains, and rubbed well to and fro with the tip of the finger. The small rolls of earthy matter so formed are brushed off, and more magnesia is laid on and left until the benzine has evaporated entirely. Materials that will bear washing are then cleaned with water; on silks, alcohol or benzine should be used instead. The process may be applied to textile fabrics of every description, except those containing very much wool, to which the magnesia adheres very tenaciously. It may also be used for stains, old or new, on all sorts of fancy woods, ivory, parchment, etc., without risk of injury. Ordinary writing ink is not affected by it, but letterpress quickly dissolves, owing to the absorption of the fatty matter in the ink.

7. A method of cleansing greasy woolen or cotton rags and waste. The rags are thrown into a closed revolving drum, with a quantity of perfectly dry and finely powdered plaster of Paris; when the plaster has absorbed all the grease, the whole is transferred to another revolving drum, pierced with holes, by which means the greater portion of the greasy plaster is got rid of. The operation is finished by beating the rags on a kind of wooden sieve.

8. In the removal of grease from clothing, with benzol or turpentine, people generally make the mistake of wetting the cloth with the turpentine and then rubbing it with a sponge or piece of cloth. In this way the fat is dissolved, but is spread over a greater space and is not removed; the benzol or turpentine evaporates, and the fat covers a greater surface than before. The way is to place soft blotting paper beneath and on top of the grease spot, which is to be first thoroughly saturated with the benzol, and then well pressed. The fat is then dissolved and absorbed by the paper, and entirely removed from the clothing.

9. Castile soap in shavings, 4 oz.; carbonate of soda, 2 oz.; borax, 1 oz.; aqua ammonia, 7 oz.; alcohol, 3 oz.; sulphuric ether, 2 oz. Soft water enough to make 1 gal. Boil the soap in the water until it is dissolved, and then add the other ingredients. Although it is not apparent what good 2 oz. of ether can do in 1 gal. of liquid, the mixture is said to be very efficient.

10. Make a weak solution of ammonia by mixing the ordinary "liquor ammoniæ" of the druggist with its own volume of cold water, and rub it well into the greasy parts, rinsing the cloth in cold water from time to time until the grease is removed. The ammonia forms a soap with the fatty acids of the grease, which is soluble in water.

11. On Paper.—Press powdered fuller's earth lightly upon the greasy spot, and allow it to soak out the grease.

12. Hannett says the spots may be removed by washing the part with ether, chloroform or benzine, and placing between white blotting paper, then passing a hot iron over.

13. A more expeditious and thought by some the best way is to scrape fine pipe clay, magnesia, or French chalk on both sides of the stain, and apply a hot iron above, taking great care that it is not too hot.

14. After gently warming the paper, take out all the grease you can with blotting paper and a hot iron, then dip a brush into essential oil of turpentine, heated almost to ebullition, and draw it gently over both sides of the paper, which must be kept warm. Repeat the operation until all is removed, or as often as the thickness of the paper may render necessary. When all the grease is removed, to restore the paper to its former whiteness, dip another brush in ether, chloroform, or benzine, and apply over the stain, especially the edges of it. This will not affect printers' or common writing ink.

15. Lay on a coat of India rubber solution over the spot, and leave it to dry. Afterward remove with a piece of ordinary India rubber. Any operation with ether, chloroform, or benzine should never be conducted by candle light, as their vapor is apt to kindle even at several feet from the liquid. No. 13 will remove grease from colored calf. Even if the spot be on the under side of the leather, it may thus be clearly drawn right through.

16. Apply a solution of pearlash (in the proportion of 1 oz. pearlash to 1 pt. water) to oil-stained drawing paper.

17. Grease can be removed from billiard or other cloths by a paste of fuller's earth and turpentine. This should be rubbed upon the fabric until the turpentine has evaporated, and a white powder remains. The latter can be brushed off, and the grease will have disappeared.

18. To Remove from Silk.—Use chloroform and a cotton cloth, finishing with a dry cloth. Benzine can also be used as well as French chalk. If chalk is used, place a hot iron over the spot until the grease is removed.

19. Spots of Grease.—On white goods, soap water or alkalies; on dyed tissues of cotton, hot soap water; dyed tissues of wool, soap water or ammonia; on silk, benzine, ether, ammonia, magnesia, chalk, yelk of egg.

Grease Extractor.—1. Fuller's earth, 15 parts; French chalk, ½ part; yellow soap, 10 parts; pearlash, 8 parts; mix thoroughly and make it into paste with spirits of turpentine. Color, if desired, with yellow ocher. Form into cakes.

2. An earthy compound for removing grease spots is made as follows: Take fuller's earth, free it from all gritty matter by elutriation with water; mix with ½ lb. of the earth so prepared ½ lb. of soda, as much soap, and 8 yelks of eggs well beaten up, with ½ lb. of purified oxgall. The whole must be carefully triturated upon a porphyry slab, the soda with the soap in the same manner as colors are ground, mixing in gradually the eggs and the oxgall previously beaten together. Incorporate next the soft earth by slow degrees, till a uniform thick paste be formed, which should be made into balls or cakes of a convenient size and laid out to dry. A little of this detergent being scraped off with a knife, made into a paste with water and applied to the stain, will remove it.

Crocks and Jars, to Remove Grease from.—Use hot water and sal soda.

Gutta Percha, to Clean.—This can be done by using a mixture of soap and powdered charcoal, polishing afterward with a dry cloth with a little charcoal on it.

Hats, to Clean White Manila.—Sprinkle with water and expose to the fumes of burning sulphur in a tight box.

Hats, Felt, to Clean.—1. Clean with ammonia and water; if greasy, wash with fuller's earth. Size with glue size, and block while warm. Glue size made by diluting hot glue with hot water. Apply inside, not outside the hat. The thicker the glue, the stiffer the hat.

2. The stains of grease and paint may be removed from hats by means of turpentine or benzine, and if the turpentine leaves a mark, finish with a little spirits of wine.

3. To remove grease stains from silk hats, use first turpentine and then alcohol.

4. Cleaning Panama Hats.—To renovate white straw hats the following method has been recommended. Prepare two solutions as given:

I.—Sodium hyposulphite	G.	10
Glycerine	"	5
Alcohol	"	10
Water	"	75
II.—Citric acid	G.	2
Alcohol	"	10
Water	"	90

First sponge the straw hat with solution No. I., and lay aside in a moist room (cellar) for twenty-four hours; then apply solution No. II. and treat similarly as before. Finally the hat should be gone over with a flatiron, not too hot. If very dirty, the hat must be cleaned with some detergent and dried before beginning the bleaching operation.—*Western Druggist.*

Alizarine Inks.—White goods, tartaric acid, the more concentrated the older are the spots. On colored cottons and woolens, and on silks, dilute tartaric acid is applied, cautiously.

Ink and Iron Mould, to Remove.—1. Equal parts of cream of tartar and citric acid, powdered fine, and mixed together. This forms the salts of lemon as sold by druggists. Directions for using: Procure a hot dinner plate, lay the part stained in the plate, and moisten with hot water; next rub in the above powder with the bowl of a spoon until stains disappear; then rinse in clean water, and dry.

2. Place the stained part flat in a plate or dish, and sprinkle crystals of oxalic acid upon it, adding a little water; the stains will soon disappear, when the linen should be well wrung out in two or three changes of clean water.

3. Dip the part in boiling water, and rub it with crystals of oxalic acid, then soak in a weak solution of chloride of lime—say 1 oz. to the quart of water. Under any circumstances, as soon as the stain is removed, the linen should be thoroughly rinsed in several waters.

4. The *Journal de Pharmacie d'Anvers* recommends pyrophosphate of soda for the removal of ink stains. This salt does not injure vegetable fiber, and yields colorless compounds with the ferric oxide of the ink. It is best to first apply tallow to the ink spot, then wash in a solution of pyrophosphate until both tallow and ink have disappeared.

5. Thick blotting paper is soaked in a concentrated solution of oxalic acid and dried. Laid immediately on a blot, it takes it out without leaving a trace behind.

6. Tin chloride, 2 parts; water, 4 parts. To be applied with a soft brush, after which the paper must be passed through cold water.

7. Hydrochloric acid and hot water, in the proportion of 8 of hot water to 1 of acid; if not strong enough, add more acid; when clear of stain, wash well and boil, to remove all traces of acid.

8. A weak solution of chloride of zinc.

9. To remove from clothes use a mixture of 4 parts of tartar and 2 parts of powdered alum. This is not injurious to clothes. Other stains may be removed with it.

10. To remove a blot, dip a camel hair brush in water, and rub over the blot, letting the water remain on a few seconds; then make as dry as you can with blotting paper, then rub carefully with India rubber. Repeat the operation if not all removed. For lines, circles, etc., dip the ink leg of your instruments in water, open the pen rather wider than the line, and trace over, using blotting paper and India rubber, as for a blot. Applicable to drawing paper, tracing paper, and tracing linen. If the surface is a little rough after, polish with your nail.

11. *Printer's Ink, to Remove.*—Put the stained parts of the fabric into a quantity of benzine, then use a fine, rather stiff brush, with fresh benzine. Dry and rub bright with warm water and curd soap. The benzine will not injure the fabric or dye.

12. *Iron Spots and Black Ink.*—White goods, hot oxalic acid, dilute muriatic acid, with little fragments of tin. On fast-dyed cottons and woolens, citric acid is cautiously and repeatedly applied. Silks, impossible.

Many additional receipts for removing ink stains will be found under **Inks.** See also *Marble* below.

Iodine Stains on Paper.—1. Apply solution of pure sodium hyposulphite, and then strong ammonia water, by means of blotting paper; remove excess by pressing between sheets of bibulous paper moistened with water, and dry between clean warm (dry) blotting pads.

2. Iodine stains may be removed by alcohol.

Iron. See also **Rust,** in the general alphabet.

Iron and Steel.—1. Take a spongy piece of fig tree wood and well saturate it with a mixture of sweet oil and finely powdered emery, and with this well rub all the rusty parts. This will not only clean the article, but will at the same time polish it, and so render the use of whiting unnecessary.

2. Bright iron or steel goods (as polished grates and fire irons) may be preserved from rust in the following manner: Having first been thoroughly cleaned, they should be dusted over with powdered quicklime, and thus left until wanted for use. Coils of piano wire are covered in this manner, and will keep free from rust for many years.

3. Dissolve ½ oz. camphor and 1 lb. hog's lard, and take off the scum; then mix with the lard as much black lead as will give the mixture an iron color. Rub the articles all over with this mixture, and let them lie for twenty-four hours; then dry with a linen cloth, and they will keep clean for months.

4. Table knives which are not in constant use should be put in a case containing a depth of about 8 in. of quicklime. They are to be plunged into this to the top of the blades, but the lime must not touch the handles.

5. Steel bits that are tarnished, but not rusty, can be cleaned with rotten stone, common hard soap, and a woolen cloth.

Iron, to Clean. — To clean iron parts of machinery, tools, etc., two to three cents, worth of paraffine chipped fine are added to one liter petroleum in a stoppered bottle, and during two or three days from time to time shaken up until the paraffine is dissolved. To apply it, the mixture is well shaken, spread upon the metal to be cleaned by means of a woolen rag or brush, and on the following day rubbed off with a dry woolen rag.

Iron Mould. See *Ink Stains* above and also Spots and Stains below.

Yellow stains, commonly called iron mould, are removed from linen by hydrochloric acid or hot solution of oxalic acid. Wash well in warm water afterward.

Iron Rust, to Remove.—1. This may be removed by salt mixed with a little lemon juice.

2. Salts of lemon, mixed with warm water and rubbed over the mark, will, most probably, remove the stains.

3. Throw on the stain a small quantity of the dry powder of magnesia, rubbing it slightly in with the finger, leaving it there for an hour or two, and then brushing it off, when it will be found that the stain has quite disappeared.

4. Fresh ink and the soluble salts of iron produce stains which, if allowed to dry, and espe-

cially if afterward the material has been washed, are difficult to extract without injury to the ground. When fresh, such stains yield rapidly to a treatment with moistened cream of tartar, aided by a little friction, if the material or color is delicate. If the ground be white, oxalic acid, employed in the form of a concentrated aqueous solution, will effectually remove fresh iron stains.

Ivory, Removal of Smoke Stains from.—Immerse in benzine; if burned, there is no remedy.

Jet, to Clean.—Remove all dust with a very soft brush, touch the jet with a bit of cotton, moistened with a little good oil, polish with wash leather. Clean with great care, as the jet is often brittle.

Kerosene Oil, to Remove from Carpets.—Spread over the stain above and below warm pipe clay, and allow it to remain twenty-four hours; then brush it off and beat out the carpet.

Knives, Stains to Remove.—Cut a solid potato in two, dip one of the pieces in brick dust, such as is usually used for knife cleaning, and rub the blade with it.

Lace, to Wash.—1. Cover an ordinary wine bottle with fine flannel, stitching it firmly round the bottle. Tack one end of the lace to the flannel, then roll it very smoothly round the bottle and tack down the other end, then cover with a piece of very fine flannel or muslin. Now rub it gently with a strong soap liquor, and, if the lace is very much discolored or dirty, fill the bottle with hot water and place it in a kettle or saucepan of suds and boil it for a few minutes, then place the bottle under a tap of running water to rinse out the soap. Make some strong starch, and melt in it a piece of white wax and a little loaf sugar. Plunge the bottle two or three times into this and squeeze out the superfluous starch with the hands; then dip the bottle in cold water, remove the outer covering from the lace, fill the bottle with hot water and stand it in the sun to dry the lace. When nearly dry take it very carefully off the bottle and pick it out with the fingers. Then lay it in a cool place to dry thoroughly.

2. First rip off the lace, carefully pick out the loose bits of thread, and roll the lace very smoothly and securely round a clean black bottle, previously covered with old white linen, sewed tightly on. Tack each end of the lace with a needle and thread to keep it smooth, and be careful in wrapping not to crumple or fold in any of the scallops or pearlings. After it is on the bottle, take some of the best sweet oil, and with a clean sponge wet the lace thoroughly to the inmost folds. Have ready in a wash kettle a strong, cold lather of clear water and Castile soap. Fill the bottle with cold water, to prevent its bursting, cork it well and stand it upright in the suds, with a string round the neck secured to the ears or handle of the kettle, to prevent its knocking about and breaking while over the fire. Let it boil in the suds for an hour or more, till the lace is clean and white all through. Drain off the suds and dry it on the bottle in the sun. When dry, remove the lace from the bottle and roll it round a wide ribbon block, or lay it in long folds; place it within a sheet of smooth white paper, and press it in a large book for a few days.

Lace, to Clean Gold and Silver.—1. Sew the lace in a clean linen cloth, boil it in 1 qt. of soft water and ¼ lb. of soap, and wash it in cold water. If tarnished, apply a little warm spirits of wine to the tarnished spots.

2. A weak solution of cyanide of potassium cleans gold lace well.

Lace, to Revive Black.—1. Make some black tea about the strength usual for drinking and strain it off the leaves. Pour enough tea into a basin to cover the quantity of lace, let it stand ten or twelve hours, then squeeze it several times, but do not rub it. Dip it frequently into the tea, which will at length assume a dirty appearance. Have ready some weak gum water, and press the lace gently through it; then clap it for a quarter of an hour; after which, pin it to a towel in any shape which you wish it to take. When nearly dry, cover it with another towel and iron it with a cool iron. The lace, if previously sound and discolored only, will after this process look as good as new.

2. Wash the lace thoroughly in some good beer; use no gum water; clap the lace well, and proceed with ironing and drying, as in the former recipe.

Leather, Wash (Chamois Skin), to Cleanse.—1. A German optical journal recommends washing soiled polishing leather in a weak solution of soda and warm water, then rubbing a good deal of soap in the leather and letting it soften for two hours. It is afterward thoroughly washed until perfectly clean, and rinsed in a weak solution of warm water, soda, and yellow soap. It must not be washed in clean water, or it will become so hard when dry that it cannot be used again. It is the small quantity of soap remaining in the leather which penetrates its smallest particles and makes the leather as soft as silk. After the rinsing it is wrung out in a coarse hand towel and dried quickly. It is then pulled in every direction and well brushed, after which it is softer and better than most wash leather when first bought. If rough leather is used to finish highly polished surfaces, it will often be observed that the surface is scratched or injured. This is caused by particles of dust and even grains of hard rouge that were left in the leather. As soon as they are removed with a clean brush and rouge, a perfectly bright and beautiful finish can be obtained.

2. Use a weak solution of soda and warm water, rub plenty of soft soap into the leather, and allow it to remain in soak for two hours, then rub it sufficiently, and rinse in a weak solution of warm water, soda, and yellow soap. If rinsed in water only, it becomes hard when dry and unfit for use. After rinsing, wring out in a rough towel, and dry quickly, then pull it about and brush it well.

Leather, to Clean.—Mix well together 1 lb. of French yellow ocher and a dessert spoonful of sweet oil; then take 1 lb. pipe clay and ¼ lb. starch. Mix with boiling water; when cold lay on the leather; when dry, rub and brush well.

Lens, Removing Rust from a.—A lens sometimes acquires a brown, rusty stain on the surface, which no amount of rubbing or cleaning will remove. By applying a paste composed of putty powder, or very fine rouge, and water to the stains, and then rubbing briskly with either the point of the finger or the side of the hand, every spot of rust or stain will be removed in a few minutes. This applies to photographic or other lenses, except the object glass of a telescope, which would be irreparably damaged by such treatment.

Lenses, to Clean.—A very soft chamois skin is best; if greasy, wipe with a little tissue paper wet with weak alkali. Lenses should be cleaned as rarely as possible; use old linen, not silk.

Lime, Lyes, Alkalies.—On white goods, simple washing in water. On dyed tissues of cotton and wool, and on silk, weak nitric acid poured drop by drop, and rub with the finger the spot previously moistened.

Linen, to prevent blistering in.—Blistering is almost always due to bad starching, but occasionally to ironing the articles when too wet. Each article must be well starched through, and when about to iron damp it evenly, but do not wet it. Use a hot iron. Collars and cuffs that have to be turned down should be fixed in the proper shape immediately after each one is ironed, for then the starch is still flexible.

Linen, to Restore Whiteness to Scorched.—½ pt. of vinegar, 2 oz. of fuller's earth, 1 oz. of dried fowl's dung, ½ oz. soap, the juice of 2 large onions. Boil all these ingredients together to the consistency of paste; spread the

composition thickly over the damaged part, and if the threads be not actually consumed, after it has been allowed to dry on, and the place has subsequently been washed once or twice, every trace of scorching will disappear.

Machinery, to Clean.—To clean iron parts of machinery, tools, etc., about 10 grm. paraffin chipped fine are added to 1 liter petroleum in a stoppered bottle, and during two or three days from time to time shaken up until the paraffin is dissolved. To apply it the mixture is well shaken, spread upon the metal to be cleaned by means of a woolen rag or brush, and on the following day rubbed off with a dry woolen rag.

Mahogany, Spots on.—Stains and spots may be taken out of mahogany with a little aqua-fortis and water, or oxalic acid and water, rubbing the part by means of cork, till the color is restored, observing afterward to wash the wood well with water, and to dry and polish as usual.

Marble, to Remove Grease from.—1. Apply a little pile of whiting or fuller's earth saturated with benzine, and allow it to stand some time.

2. Or apply a mixture of 2 parts washing soda, 1 part ground pumice stone, and 1 part chalk, all first finely powdered and made into a paste with water; rub well over the marble, and finally wash off with soap and water.

Marble, to Clean.—1. Mix with water 5 parts soda, 2½ parts powdered chalk, 2½ parts pumice stone (powdered). Wash the spots with this mixture; then wash off with soap and water.

2. To extract oil from marble or stone, soft soap, 1½ part; fuller's earth, 3 parts; potash, 1½ part, boiling water to mix. Apply to the grease spots and let it remain two or three hours.

3. Marble, to Remove Oil Stains in.—Stains in marble caused by oil can be removed by applying common clay saturated with benzine. If the grease has remained long enough it will become acidulated, and may injure the polish, but the stain will be removed. Boil ½ lb. soft soap in 1 qt. water, very slowly, until the water is reduced to 1 pt. Apply this in the same manner as the preceding.

4. Take 2 parts common soda, 1 part pumice stone, and 1 part finely powdered chalk; sift it through a fine sieve and mix with water; then rub it well all over the marble, and the stains will be removed; then wash the marble over with soap and water, and it will be as clean as it was at first.

5. A bullock's gall, 1 gill soap lees, ½ gill turpentine. Mix into a paste with pipe clay. Apply to the marble, allow it to remain two or three days, then rub off.

6. Cover the soiled part with a paste of quicklime, moistened with a strong aqueous solution of sal soda for several hours; then remove the paste, wash the parts thoroughly, and polish if necessary.

7. Common soda, 3 parts; pumice stone, 1½ part; finely powdered chalk, 1½ part; sift very fine, and mix with water. Rub all over the marble. Wash well with soap and water.

8. If the marble is white, coat it with gum arabic and expose to the sun. When it peels off wash with water, or make a paste with fuller's earth and hot water, cover the spots therewith, let it dry on, and next day scour off with soft soap. The luster can be restored by rubbing with a dry cloth.

9. Be sure that the dust is all brushed from the marble. Rub with the following: Whiting, 6 oz.; soft soap, 6 oz.; soda, 1½ oz.; a piece of stone blue size of a large walnut. Mix and rub on the marble with a flannel cloth. Let it remain for twenty-four hours. Wash off and polish with a piece of flannel.

10. To take Stains from White Marble.—Turpentine, 2¼ tablespoonfuls; lye, 1½ gills; oxgall, 1½ oz.; pipe clay, q. s. to make a paste. Apply the paste to the stain and let it remain for several days. Iron mould or ink spots may be taken out by dissolving in 1½ pt. rain-water, 1½ oz. oxalic acid, ¾ oz. butter antimony, flour sufficient to make the mixture of a proper consistency. Put on with a brush, let it remain a few days, wash off. Grease spots may be removed by applying common clay saturated with benzine.

11. Ink Stains on Marble.—Dissolve 1 oz. antimony trichloride and 2 oz. oxalic acid in 1 qt. of water. Add flour enough to make a paste. Leave on the spot for a few days until the spot is removed.

12. Iron Stains in Marble.—Boil your marble in a strong solution of caustic soda, then take out, and rub well. Soon all the stains will come out.

13. Matches, to Remove Marks made by.—Spots from sulphur and phosphorus caused by lucifer matches can be extracted from marble by carbon disulphide; or take 2 parts of common soda, 1 part of pumice stone and 1 part of finely powdered chalk; sift it through a fine sieve and mix it with water: then rub it well all over the marble, and the stains will be removed, then wash the marble over with soap and water, and it will be as clean as it was at first.

Matting, to Clean.—Wash with water in which bran has been boiled, or in weak salt and water. Dry it well with a cloth.

Mildew.—1. Well mix together a spoonful of table salt, 2 of soft soap, 2 of powdered starch, and the juice of a lemon. Lay this mixture on both sides of the stain with a painter's brush, and then lay the article on the grass, day and night, until the stain disappears.

2. Get a piece of flannel, dip it into whisky, and well rub the place marked; then iron on the wrong side, taking care to put a piece of damp cotton cloth between the iron and silk, and iron on the cotton cloth, which will prevent the silk assuming a shiny glazed appearance.

3. Wash clean and take every particle of soap off, then put the linen into a galvanized bath or tub full of clean cold water, procure a little chloride of lime, and tie it up in a muslin bag or piece of muslin, dissolve the lime in lukewarm water by squeezing the bag, then pour the water among the clothes. Stir and leave them for 24 hours, but do not put too much lime in, or you will rot the clothes; then well rinse in clean cold water.

4. Hypochlorite of alumina is said to be one of the best remedies. Moisten with water, rub well into the cloth, moisten again with dilute sulphuric acid (1 to 20), and, after half an hour, rinse thoroughly in soft water and then in water containing about an ounce to the gallon of sulphite or hyposulphite of soda. A stiff brush may be advantageously employed in applying the hypochlorite.

Mildew, to Prevent.—Housekeepers are often greatly troubled and perplexed by mildew from damp closets and from rust. By putting an earthen bowl or deep plate full of quicklime into the closet, the lime will absorb the dampness and also sweeten and disinfect the place. Rats, mice, and many bugs that are apt to congregate in damp places have a dislike to lime. As often as the lime becomes slaked throw it on the compost heap if in the country, or into the ash barrel if in the city.

Mildew, to Prevent in Canvas, etc.—Dissolve 1 lb. zinc sulphate in 40 gal. water, and then add 1 lb. sal soda. When dissolved, 2 oz. tartaric acid are added. This holds the partially separated zinc carbonate without neutralizing the excess of alkali used. The canvas, etc., should be soaked in this solution for 24 hours, and then dried without wringing.

Mildew, to Remove from Brickwork.—Builders' acid (hydrochloric acid) is often used for removing white stains from brickwork. Its efficacy in the case of mildew would be doubtful. A coat of linseed oil on the perfectly dry brick would have a good preventive ten-

dency. Melted paraffin applied hot, and worked in with a paint burner would also be efficacious. Perhaps either of the last named applications would destroy the mildew or white stain also. Acid used by an experienced man would not injure the joints.

Canvas, Rendering it Mildew-proof.—1. Saturate the cloth in a hot solution of soap (¼ lb. to a gal. of water); wring out and digest it for twelve hours in solution of ½ lb. alum to 1 gal. of water.

2. Treatment with strong aqueous solution of alum or lead acetate answers very well.

Use the following: Alum, 2 lb., dissolved in 60 lb. water; blue vitriol, 2 lb., dissolved in 8 lb. water; to which is added gelatine, 1 lb. dissolved in 30 lb. water; lead acetate, ½ lb. dissolved in 30 lb. water. The solutions are all hot, and separately mixed, with the exception of the vitriol, which is added. See also receipts for waterproofing cloth.

To Remove from Canvas.—Wash with solution of calcium hypochlorite (bleaching powder) in cold water or vinegar. Use plenty of cold water afterward.

Cotton Goods, to Remove from.—If the goods are colored, soak for twenty-four hours or more in sour milk or buttermilk, then rinse in water, and wash in strong soapsuds. If the goods are white, moisten the spots repeatedly with Javelle water, diluted with volumes of water; rinse well, then wash in strong soapsuds, not too hot.

Gold Lace, to Remove Mildew from.—For this purpose, no alkaline liquors are to be used; for while they clean the gold, they corrode the silk, and change or discharge its color. Soap also alters the shade, and even the species, of certain colors. But spirit of wine may be used without any danger of its injuring either color or quality, and in many cases proves as effectual for restoring the luster of the gold as the corrosive detergents. But though the spirit of wine is the most innocent material employed for this purpose, it is not in all cases proper. The golden covering may be in some places worn off, or the base metal, with which it has been alloyed, may be corroded by the air, so as to have the particles of gold disunited, while the silver underneath, tarnished to a yellow hue, may continue of a tolerable color; so it is apparent that the removal of the tarnish would be prejudicial, and make the lace less like gold than it was before.

Linen, Mildew from.—1. Take soap and rub it well; then scrape some fine chalk, and rub that also in the linen; lay it on the grass; as it dries, wet it a little, and it will come out at once.

2. Two tablespoonfuls of soft soap and the juice of a lemon. Lay it on the spots with a brush, on both sides of the linen. Let it lie a day or two till the stains disappear.

Nets, to Prevent from Rotting.—The following treatment is said to preserve nets for a long time in a good condition: Soften 1 lb. good glue in cold water; then dissolve it in 10 gal. of hot soft water, with ½ lb. curd soap. Wash the nets in soft water, then boil them in this for two hours, press out excess of the liquid and hang up overnight. The second bath consists of alum, 2 lb.; water, 5 gal.; heat nearly to boiling, and immerse the nets in this for about three hours, then press and transfer to a strong decoction of oak bark or a solution of sumac in warm water (water, 5 gal.; sumac, 8 lb.), and let them remain immersed in this for forty-eight hours, or longer, if convenient.

Paper, to Remove Mildew from.—Soak 1 oz. of gelatine for some hours in 1 pt. of water, and 1 oz. of white soap scraped, in the same quantity of water; mix the two solutions and boil till dissolved. Dissolve 1 drm. of alum in 2 oz. of water, and add it to the above. When the mixture is cold, decant the solution from all sediment. Spread the above over the damaged paper with a stout feather. If the paper be in a very bad state, a second coat may be applied. A little spirits of wine added to the solution tends to keeps it good.

Ropes, the Preservation of.—The ropes should be dipped, when dry, into a bath containing 20 grm. of sulphate of copper per liter of water, and kept in soak in this solution for four days, afterward being dried. The ropes will thus have absorbed a certain quantity of sulphate of copper, which will preserve them from the attacks of animal parasites and from rot. The copper salt may be fixed in the fiber by a coating of tar or by soapy water. For tarring the rope it is best to pass it through a bath of boiled tar, hot, drawing it through a thimble to press back the excess of tar, and suspending it afterward on a staging to dry and harden. In the second method, the rope is soaked in a solution of 100 grm. of soap per liter of water. The copper soap thus formed in the fiber of the rope preserves it from rot even better than the tar, which acts mechanically to imprison the sulphate of copper, which is the real preservative. It is not stated whether the copper treatment is equally serviceable with dressed as with plain hemp ropes.

Ropes, to Prolong the Life of.—To prolong the duration of ropes, steep them in a solution of sulphate of copper, 1 oz. to 1 qt. of water, and then tar them.

Stone, Mildew or Mould, to Remove from.—Try a little strong aqueous solution of caustic soda. It should remain ten minutes in contact with the stone, which, after washing with water, should be well rubbed with a stiff brush or broom.

Milk and Coffee Stains, to Remove.—These stains are very difficult to remove, especially from light colored and finely finished goods. 1. From woolen and mixed fabrics they are taken out by moistening them with a mixture of 1 part glycerine, 9 parts water, and ½ part aqua ammonia. This mixture is applied to the goods by means of a brush, and allowed to remain for twelve hours, occasionally renewing the moistening. After this time, the stained pieces are pressed between cloth, and then rubbed with a clean rag. Drying, and if possible a little steaming, is generally sufficient to thoroughly remove the stains.

2. Stains on silk garments which are dyed with delicate colors, or finely finished, are more difficult to remove. In this case 5 parts glycerine are mixed with 5 parts water, and ¼ part of ammonia added. Before using this mixture it should be tried on some part of the garments where it cannot be noticed, in order to see if the mixture will change the color. If such is the case, no ammonia should be added. If, on the contrary, no change takes place, or if, after drying, the original color is restored, the above mixture is applied with a soft brush, allowing it to remain on the stains for six or eight hours, and is then rubbed with a clean cloth. The remaining dry substance is then carefully taken off by means of a knife. The injured places are now brushed over with clean water, pressed between cloths and dried. If the stain is not then removed, a rubbing with dry bread will easily take it off. To restore the finish, a thin solution of gum arabic, or in many cases beer is preferred, is brushed on, then dried and carefully ironed. By careful manipulation these stains will be successfully removed.

To Remove Nitric Acid Stains.—1. According to *Reimann's Faerber Zeitung*, these yellow stains, so familiar to the chemist and druggist, can be removed either from the skin or from brown or black woolen garments by moistening the spots for a while with permanganate of potash and rinsing with water. A brownish stain of manganese remains, which may be removed from the skin by washing with aqueous solution of sulphurous acid. If the spots are old, they cannot be entirely removed.

2. Nitric Acid Stains, to Remove from the Hands.—Touch the stains with solution of permanganate of potassium; wash, rinse in dilute hydrochloric acid, and wash again.

Oil Cloths, to Renovate.—Dissolve 2½ lb. paraffin and 1 gal. oil of turpentine by the aid of a gentle heat, and apply with a sponge or piece of flannel, while warm. Let it remain on the oil cloth twenty-four hours; then polish with flannel. This solution not only renovates but preserves the cloth. It has been used on oil cloths which have been down four years, and they look as good as new. The same preparation may also be used on painted floors. When rubbed with flannel, it will have a beautiful gloss, equal to varnish.

Oil Cloth, to Clean.—1. Wash with a large soft woolen cloth and lukewarm or cold water, dry thoroughly with a soft cloth, and afterward polish with milk, or a weak solution of beeswax, in spirits of turpentine. Never use a brush, or hot water, or soap, as either will be certain to bring off the paint.

2. Wash with equal quantities of milk and water. Once in several months a little linseed oil may be used. It must be well rubbed in and polished with a piece of silk.

Oil Colors, Varnish and Resins.—On white or colored linens, cottons, or woolens, use rectified oil of turpentine, alcohol lye, and their soap. On silks, use benzine, ether, and mild soap, very cautiously.

Oil Stains on Paper.—Use pipe clay mixed with water. Allow it to remain on the spot for several hours.

Floors, Oil Stains, to Remove from.—Use oxalic acid and water, then wash well with soda and soap.

For additional receipts for removing oil stains, see also *Grease*, above.

Paint Brushes, to Clean.—1. When a paint brush is stiff and hard through drying with paint on it, put some turpentine in a shallow dish and set on fire. Let it burn for a minute until hot, then smother the flame and work the pencil in the fingers, dipping it frequently into hot spirits. Rinse all paint brushes, pencils, etc., in turpentine, grease with a mixture of sweet oil and tallow, to prevent them from drying hard, and put them away in a close box.

2. To soften brushes that have become hard, soak them twenty-four hours in raw linseed oil, and rinse them out in hot turpentine, repeating the process till clean; or wash them in hot soda and water and soft soap.

Paint, to Clean.—1. To clean paint, provide a plate with some of the best whiting to be had; have ready some clean warm water and a piece of flannel, which dip into the water and squeeze nearly dry; then take as much whiting as will adhere to it, and apply it to the painted surface, when a little rubbing will instantly remove any dirt or grease. After which, wash the part well with clean water, rubbing it dry with a soft chamois. Paint thus cleaned looks as well as when first laid on, without any injury to the most delicate colors. It is far better than using soap, and does not require more than half the time and labor.

2. To clean paint, take 1 oz. pulverized borax, 1 lb. small pieces best brown soap, and 3 qt. water; let simmer till the soap is dissolved, stirring frequently. Do not let it boil. Use with a piece of old flannel, and rinse off as soon as the paint is clean. This mixture is also good for washing clothes.

3. Dissolve ½ oz. glue and a bit of softsoap the size of a walnut in about 3 pt. of warm water, and with a well-worn whitewash brush well scrub the work, but not sufficient to get off the paint, and rinse with plenty of cold clean water, using a wash leather; let dry itself. Work done in this manner will often look equal to new.

4. First take off all the dust with a soft brush and a pair of bellows. Scour with a mixture of soft soap and fuller's earth, and use lukewarm water. If there are any spots which are extra dirty, first remove these by rubbing with a sponge dipped in soap and water. Commence the scouring at the top of the door or wainscot, and proceed downward; and dry with a soft linen cloth. When cleaning paint, it is always better to employ two persons, one to scour and the other to rub dry.

Paint, to Remove.—1. Scraping or burning it off is extremely laborious, and too slow for general purposes. A more thorough and expeditious way is by chemical process, using for that purpose a solution of soda and quicklime in equal proportions. The solution may be made as follows: The soda is dissolved in water, the lime is then added, and the solution is applied with a brush to the old paint. A few moments are sufficient to remove the coats of paint, which may be washed off with hot water. The oldest paint may be removed by a paste of the soda and quicklime. The wood should be afterward washed with vinegar or an acid solution before repainting, to remove all traces of the alkali.

2. Wet the place with naphtha, repeating as often as is required; but frequently one application will dissolve the paint. As soon as it is softened rub the surface clean. Chloroform, mixed with a small quantity of spirit ammonia, composed of strong ammoniac, has been employed very successfully to remove the stains of dry paint from wood, silk, and other substances.

3. To Remove from Floors.—Take 1 lb. American pearlash, 3 lb. quick stone lime, slake the lime in water, then add the pearlash, and make the whole about the consistence of paint. Lay the mixture over the whole body of the work which is required to be cleaned, with an old brush; let it remain for 12 or 14 hours, when the paint can be easily scraped off.

To Soften Putty and Remove Old Paint.—1. Take 3 lb. of quick stone lime, slake the lime in water, and then add 1 lb. of American pearlash. Apply this to both sides of the glass, and let it remain for twelve hours, when the putty will be softened, and the glass may be taken out without being broken. To destroy paint apply it to the whole body of the work which is required to be cleaned; use an old brush, as it will spoil a new one; let it remain about twelve or fourteen hours and then the paint may be easily scraped off.

2. To remove paint from old doors, etc., and to soften putty in window frames, so that the glass may be taken out without breakage or cutting, take 1 lb. of pearlash and 3 lb. of quicklime; slake the lime in water, and then add the pearlash, and make the whole about the consistence of paint. Apply it to both sides of the glass, and let it remain for twelve hours, when the putty will be so softened that the glass may be taken out of the frame without being cut and with the greatest facility. To destroy paint, lay the above over the whole body of the work which is required to be cleaned, using an old brush (as it will spoil a new one); let it remain for twelve or fourteen hours, when the paint can be easily scraped off.

3. Paint Stains on Glass.—American potash, 3 parts; unslaked lime, 1. Lay this on with a stick, letting it remain for some time, and it will remove either tar or paint.

4. Common washing soda dissolved in water. Let it soak awhile—if put on thick, say 30 minutes—and then wash off. If it does not remove, give it another application.

Paint, Varnish and Resin Stains on Clothes.—1. For white or colored cotton and woolen goods, oil of turpentine or benzine, followed by soapsuds. For silk, benzine, ether, soap; hard rubbing is to be avoided. For all kinds of fabrics chloroform is best, but must be carefully used.

2. Stains of paint or varnish, after being softened with olive oil or fresh butter, may gener-

ally be removed by the same means as ordinary grease spots.

3. Saturate the spots with a solution of equal parts turpentine and spirits of ammonia; wash out with strong soapsuds.

4. Paint stains that are dry and old may be removed from cotton or woolen goods with chloroform. First cover the spot with olive oil or butter.

Paintings, to Clean.—1. Dissolve a little common soda in urine, then add a grated potato and a little salt; well rub this over the paintings till clean. Wash off in spring water and dry with a clean cloth.

2. First rub the picture well with good whisky, which will make the varnish come off in froth, then wash well with cold water, and when dry varnish again; this will restore the picture to its original color unless very old. Keep the picture covered from dust until the varnish is dry.

Papier Mache Goods, Renovation of.—1. ½ pint linseed oil, ½ pint old ale, the white of an egg, 1 oz. spirits of wine, 1 oz. hydrochloric acid; well shake before using. A little to be applied to the face of soft linen pad, and lightly rubbed for a minute or two over the article to be restored, which must afterward be polished off with old silk handkerchief. This will keep any length of time if well corked. Invaluable for delicate cabinet work.—*Dustpan.*

2. Wash with water, dredge with flour, and polish with a dry flannel cloth.

Paraffin Oil, to Extract from Floor.—A strong hot solution of oxalic acid applied, and by the after use of the scrubbing brush, you will remove all the stain from your boards.—*A. E. B. Smith.*

Parchment, to Clean.—Immerse the parchment in a solution of acetic acid, and gently rub the stained parts while wet on a flat board with lump pumice, then bleach it with chloride of lime. This process was recommended in the *English Mechanic.* It is not very successful, but it makes it white enough for bookbinding. It has, however, the objectionable qualities of not making the parchment flexible, and when dried it is as hard as a board, and it has no gloss like the virgin parchment. On no account must the parchment be washed in very hot water, or held before a fire, as it will shrivel up in a most provoking manner.

Pearls, to Clean.—Soak them in hot water in which bran has been boiled, with a little cream of tartar and alum, rubbing gently between the hands when the heat will admit of it. When the water is cold renew the application till any discoloration is removed, rinse in lukewarm water; lay them on white paper in a dark place to cool.

Piques and Colored Muslins.—French method: Make a strong lather with best white soap dissolved in soft water, and use while rather warm, but not hot. Wash the dress in this, but do not soak it previously. As soon as the lather appears soiled squeeze out the dress, throw away the lather, and wash the dress again in a second lot, and so continue until the dress is thoroughly clean. Then well rinse it in cold water, and afterward in cold water slightly blued. Squeeze all the water out of the dress, but do not wring it, and hang in a shady place to dry, or, if the weather be wet, dry it before the fire. When dry they are to be starched. It is in this operation that the failures in getting up muslins and piques more often occur than in the washing. Use a large basin and have plenty of starch, and dissolve in the starch, according to the quantity of it, 3 or 4 in. of composite or wax candle. Squeeze the starch well out of the dress, and while it is still wet put it between some old sheets or table cloths, and pass it between the rollers of a wringing machine or under a mangle; by this means all lumps of starch will be removed. Finish by ironing. Piques should be ironed on the wrong side, as lightly as possible.

Plush, to Clean. See *Velvets* below.

Plush, to Renovate.—Clean it with the usual solvent, for which see table. Then, to restore the plush, hold the wrong side over steam arising from boiling water, until the pile rises; or dampen lightly the wrong side of the plush, and hold it over a pretty hot oven, not hot enough to scorch, however, or make a clean brick hot; place upon it a wet cloth, and hold the plush over it, and the steam will raise it.

Pots, Iron, to Clean.—Put a few ounces of washing soda (sodium carbonate) into the pot, fill with water, and boil until the inside looks clean.

Lightning Renovator.—Castile soap, 4 oz.; hot water, 1 qt. When the soap is dissolved, add water, 4 qt.; water of ammonia, 4 fl. oz.; sulphuric ether, 1 fl. oz.; glycerine, 1 fl oz.; alcohol, 1 oz. *Medical Brief* states that this is an excellent preparation for removing grease.

Rugs, Goatskin, to Clean.—One washing with warm (not hot) suds will not materially hurt the skin itself. The skin may not seem quite so soft after the washing, but if the washing is done quickly, the skin well rinsed in cold water, and dried with only moderate warmth, being frequently turned and shaken, the difference will hardly be perceptible.

Rust Spots, to Remove.—By adding 2 parts cream of tartar to 1 part oxalic acid ground fine and kept dry in a bottle, you will find, by applying a little of the powder to rust stains while the article is wet, that the result is much quicker and better. Wash out in clear warm water to prevent injury to the goods.

Rust, Black Ink.—On white goods, warm solution oxalic acid; weak muratic acid. On dyed tissues of cotton, repeated washings with citric acid if the color is well dyed. Ditto of wool, same; weak muratic acid if the wool is of the natural color. On silk, no remedy.

Satins, to Clean.—1. Satins may be cleansed with a weak solution of borax or benzine when greasy. Care should be taken to sponge moderately and lengthwise, not across, the fabric; iron on the wrong side only. White, cream, and pink satins may be treated in the same way as cream colored silks.

2. To Clean Black.—Boil 3 lb. potatoes to a pulp in a quart of water; strain through a sieve, and brush the satin with it on a board or table. The satin must not be wrung, but folded down in cloths, for three hours, and then ironed on the wrong side.

Scouring Liquid.—(M. Le Clerc.) For scouring and removing grease from tissues of all kinds and worn clothes. To take out spots the liquid is used pure, but for general scouring it is mixed with 4 or 5 times its own quantity of water. In 22 gal. hot water dissolve 15½ lb. white Marseilles soap; $1\frac{1}{16}$ lb. carbonate of potash; or 15 or 18 lb. soft soap. To the solution add extract of Panama, $1\frac{1}{16}$ lb. In another vessel mix ox or sheep gall, 15 qt.; and ammonia at 22°, 3 pt. Heat this mixture, skim it, let it cool, and then add alcohol at 90°, $3\frac{5}{8}$ gal.; decant and filter. Take ⅛ part of the soap mixture and ⅔ part of the gall mixture, and add some aromatic essence.

Scouring Preparation for Removing Grease.—1. 1 oz. camphor dissolved in 3 oz. alochol. Add 4 oz. essence of lemon.

2. Camphine, 8 oz.; alcohol, 1 oz.; sulphuric ether, 1 oz.; essence of lemon, 1 drm.

3. Alcohol, 8 oz.; white soap, 1½ oz.; ox gall, 1½ oz.; essence of lemon, ⅛ to ¼ oz.

Scouring Paste.—See also **Putz Powder.**—Oxalic acid, 1 part; iron peroxide, 15 parts; powdered rotten stone, 20 parts; palm oil, 60 parts; petrolatum, 4 parts. Pulverize the oxalic acid and add rouge and rotten stone, mixing thoroughly, and sift to remove all grit; then add gradually the palm oil and petrolatum, incorporating thoroughly. Add oil of myrbane or oil of lavender to suit. By substituting your red ashes from stove coal, an inferior representative of the foregoing paste will be produced.

Removal of Stains and Grease Spots.

The following table gives at a glance the best means of cleansing all kinds of fabrics from any stain whatever.

KIND OF STAIN,	FROM LINEN.	FROM COLORED GOODS.		FROM SILKS.
		COTTON.	WOOLEN.	
Sugar, glue, blood and albumen.	Simple washing with water.			
Grease.	Soapsuds, alkaline lyes.	Lukewarm soapsuds.	Soapsuds, ammonia.	Benzine, ether, ammonia, potash, magnesia, chalk, yelk of egg.
Varnish and oil paints.	Turpentine, or benzine, and soap.			Benzine, ether, soap; rub carefully.
Stearine.	Very strong alcohol, 95°.			
Vegetable colors, red wine, fruit, red ink.	Sulphur vapors; warm chlorine water.	Wash out with warm soapsuds or ammonia water.		The same; rub gently and carefully.
Alizarine ink.	Tartaric acid; the older the stain the stronger the solution.	Dilute tartaric acid if the stuff will bear it.		The same; with care.
Iron rust and ink made of galls.	Warm oxalic acid solution; dilute hydrochloric acid, then tin turnings.	Repeated washings with a solution of citric acid, if the colors will bear it.	The same; dilute hydrochloric acid if the wool is dyed naturally.	Nothing can be done; and all attempts only make it worse.
Lime, lye, or alkalies.	Simply wash with water.	Drop dilute nitric acid upon it. The stain previously moistened can be rubbed off with the finger.		
Tannin, green nut shells.	Javelle water, warm chlorine water; concentrated solution of tartaric acid.	Alternate washing with water and with more or less dilute chlorine water, according to the colors.		
Coal tar, wagon grease.	Soap, oil of turpentine, alternating with a stream of water.	Rub with lard, then soap it well. After a time wash alternately with water and turpentine.		The same; but use benzine instead of turpentine, and the water must fall on it from some height.
Acids.	Red acid stains are destroyed by ammonia, followed by thorough washing with water. Brown stains of nitric acid are permanent.			

With the above table, a few simple chemicals, and a good deal of care and perseverance, any one may set up a chemical cleaning establishment. Great pains must be taken when ether and benzine are employed to avoid their taking fire, the vapor of which when mixed with air is highly explosive. An open bottle of ether will take fire at a distance of several feet from an open flame, as a heavy invisible vapor issues from the bottle; when the vapor reaches the flame of a lamp the whole mass of vapor takes fire.—*Muster Zeit.*

Scouring Bricks.—Scouring brick may be made by mixing sand with a small percentage of clay and baking. The quantity and heat required may be easily ascertained by trial. Mucilage and gums may be used, but they are not equal to clay as a cement for scouring brick. A very small portion of Portland cement might be made available, to avoid the baking process.

Shawls, to Clean.—White woolen shawls will not always stand washing successfully. A safe way to clean such an article is to brush all the dust out, spread it on a table, then sprinkle over it a quantity of finely ground white starch (rice or potato, not wheat); fold up the shawl into a square, powdering liberally between each fold. The shawl should be put away for several hours, and then be opened and dusted. The starch will have absorbed all the grease that may have been present and collected the dust. If such shawls are very dirty, they may be pressed between two damp blankets before the starch is put on. Gray and light blue woolen shawls may be treated in the same way, only using slightly blued starch instead of pure white starch. The shawls must be well shaken to get rid of the powder.

Shirts, Laundrying of.—(Chinese Method.) A rather thick starch paste is prepared by first beating up a handful of raw starch, usually corn starch, and a teaspoonful of fine rice flour with about 1 qt. of water, making a liquid of creamlike consistence. A certain quantity (determined alone by personal experience) is poured into a quantity of boiling water, while the latter is violently stirred with a short wooden spatula. With this the portions of the linen to be dressed are well smeared, the linen moist from wringing and the starch quite hot. Thus smeared the pieces are laid aside for a few minutes, then rubbed well between the hands, so that the paste is well distributed in the fabric. The linen is then usually dried by artificial heat. When ready for ironing, the starched portions are dampened by means of a cloth dipped in raw starch water, to which has been added a small quantity—about ½ an oz. to the qt. of blood albumen—clarified serum of bullock's blood. The proportion of starch in this water is usually about as 1 to 50 of water. In ironing the irons are first made very hot, and cooled somewhat externally just before using by momentarily plunging them into a pail of water. The irons commonly employed are what are termed polishing irons—they have the posterior edge rounded instead of angular, as in the ordinary smoothing or sadiron. Much of the fine gloss observed on shirts laundried by Chinamen is accomplished by the skillful manipulation of this "rounded edge" over the work—a manipulation very difficult to describe in words. It is most laborious work for those not accustomed to it. It not only renders the surface glossy, but imparts easy flexibility to the heavily starched fabric otherwise not attainable. Custom made shirts are usually laundried before delivery in trade at the factory, the ironing in these cases being largely performed by steam mangles, though some are hand finished. The following receipt for a laundry starch is said to produce a very fine and lasting gloss on linen without the expenditure of the amount of labor in ironing usually requisite to produce a fair appearance:

Corn starch	1	oz.
Water, boiling	1⅞	pt.
Bluing	q. s.	

To this when it has cooled somewhat is added and thoroughly mixed in about half an ounce of the following preparation:

Gum arabic	8⅛	parts.
Sugar, loaf	2½	"
Soap, white curd	¼	"
Water glass ("A" sirup)	1	"
Egg albumen	4	"
Water, warm	20	"

In preparing this the first three ingredients are dissolved together in the water at boiling heat, the water glass is then added, and when the mixture has cooled down to about 150° Fah. the egg albumen is put in and the whole well beaten together.

2. Starch, 1 oz.; paraffin, about 3 drm.; white sugar, tablespoonful; table salt, tablespoonful; water, q. s. Rub up the starch with soft water into a thick smooth paste. Add nearly or quite a pint of boiling water, with the salt and sugar dissolved in it, and, having dropped in the paraffin, boil for at least half an hour, stirring to prevent burning. Strain the starch and use while hot. Sufficient bluing may be added to the water, previous to the boiling, to overcome the yellowish cast of the starch, if necessary. Spermaceti may be used in place of paraffin. Starched linen can only be properly finished by hard pressure applied to the iron.

3. Glossed Shirt Bosoms.—Take 2 oz. of fine white gum arabic powder, put it in a pitcher and pour on a pint or more of water, and then, having covered it, let it stand all night. In the morning, pour it carefully from the dregs into a clean bottle, cork, and keep it for use. A teaspoonful of gum water stirred in a pint of starch, made in the usual way, will give to lawns, white or printed, a look of newness, when nothing else can restore them, after they have been washed.

4. Melt 2½ pounds of the very best A1 paraffin wax over a slow fire. When liquefied, remove from the fire and stir in 100 drops oil of citronella. Have some new round pie tins; place them on a level table, coat them slightly with sweet oil, and pour about six tablespoonfuls of the enamel into each tin. The pan may be floated in water to cool the contents sufficiently to permit the mixture to be cut or stamped out with a tin cutter into small cakes about the size of a peppermint lozenge. Two of these cakes added to each pint of starch will cause the smoothing iron to impart the finest possible finish to muslin or linen, besides perfuming the clothes.

5. Take of white wax, 1 oz.; spermaceti, 2 oz.; melt them together with a gentle heat. When you have prepared a sufficient amount of starch, in the usual way, for a dozen pieces, put into it a piece of the polish about the size of a large pea; using more or less, according to large or small washings. Or thick gum solution (made by pouring boiling water upon gum arabic) may be used. One tablespoonful to a pint of starch gives clothes a beautiful gloss.

Shoes, to Clean.—Kid Boots, how to Renovate Tops of.—Defaced kid boots will be greatly improved by being rubbed well with a mixture of cream and ink.

Shoes, White Satin, to Clean.—Put in the shoe something which will fill it out. Then rub the shoe gently with a piece of muslin dipped in spirits of wine. Do this several times. Then wipe the shoe carefully with a piece of dry muslin.

Show Windows, to Clean.—A good cleaning powder for show windows and mirrors is prepared by moistening calcined magnesia with pure benzine, so that a mass is formed sufficiently moist to let a drop form when pressed. The mixture has to be preserved in glass bottles with ground stoppers, in order to retain the easily volatile benzine. A little of the mixture is placed on a wad of cotton and applied to the glass plate. Do not use near a fire or light, as the benzine vapor is very inflammable and explosive.

Silk Cleaner.—Soft soap, ½ lb.; brandy, 2 teaspoonfuls; proof spirit, 1 pt.; water, 1 pt.; mix well together. Apply with a sponge on each side of the silk, taking care not to crease the silk. Rinse 2 or 3 times and iron on the wrong side, putting a piece of thin muslin between the silk and the iron.

Silk, to Clean.—No silks look well after washing, no matter how carefully it may be done, and, therefore, it should never be resorted to,

without absolute necessity. It is recommended to sponge faded silks with warm water and soap, and then to rub them with a dry cloth on a flat board, after which, to iron them on the inside with a smoothing iron. Sponging a little with spirits will also improve old black silks. The ironing may be done on the right side, with thin paper spread over them to prevent glazing.

Silk, White, to Clean.—White silk is best cleaned by dissolving curd soap in water as hot as the hand can bear, and passing the silk through and through, handling it gently, and rubbing any spots till they disappear. The silk should then be rinsed in lukewarm water, and stretched by pins to dry.

Black, to Clean.—To bullock's gall add boiling water sufficient to make it warm, and with a clean sponge rub the silk well on both sides; squeeze it well out, and proceed in like manner. Rinse it in spring water, and change the water until perfectly clean. Dry it in the air, and pin it out on a table; but first dip the sponge in glue water, and rub it on the wrong side; then dry before a fire.

Silk, Black, to Renovate.—The French process is to use a weak solution of coffee water. Do not wet the silk too much, and restore the luster by careful rubbing with a soft silk handkerchief. White silks can be cleaned with a dry powder formed of fine starch and a little laundry blue. Rub over the tissue and dust out thoroughly. Bread crumbs or chalk should be used for pink or cream colored silks. Silks may be ironed on the wrong side with a moderately hot iron, or on the right side (to give the fine luster) if well protected by two folds of slightly damped muslin.

Silver, to Clean.—1. Silver articles discolored by sulphureted hydrogen may be cleaned by rubbing them with a boiling saturated solution of borax. Another good preparation is a solution of caustic potash with some bits of metallic zinc.

2. Silver which has become much tarnished may be restored by immersion in a warm solution of 1 part cyanide of potassium to 8 parts of water. (This mixture is extremely poisonous.) Washing well with water, and drying, will produce a somewhat dead-white appearance, which may be quickly changed to a brilliant luster by polishing with a soft leather and rouge.

3. Wash in hot soapsuds (use the silver soap if convenient); then clean with a paste of whiting and whisky. Polish with buckskin. If silver was always washed in hot suds, rinsed well, and wiped dry, it would seldom need anything else.

4. A fresh concentrated solution of hyposulphite of soda will dissolve at once the coat of sulphide of silver, which is the cause of the blackness produced by mustard, eggs, etc., or anything containing sulphur.

5. Add gradually 8 oz. of prepared chalk to a mixture of 2 oz. of spirits of turpentine, 1 oz. of alcohol, ½ oz. of spirits of camphor, and 2 drm. of aqua ammonia. Apply with a soft sponge, and allow it to dry before polishing.

Silver Cleaning Compounds.—1. Ammonium carbonate, 1 oz.; water, 4 oz.; Paris white, 16 oz.; mix well, and apply by means of soft leather.

2. Rouge (very fine) and prepared chalk, equal parts; use dry.

3. Whiting (fine), 2 pt.; white oxide of tin, 1 pt.; calcined hartshorn, 1 pt.

Silver Spoons, to Remove Yellow Coating from.—1. Dissolve 1 oz. cyanide of potassium in 1 qt. of soft water and you will have a dip in which you can wash your spoons and instantly remove the sulphide of silver. The solution must be kept in a bottle that is tightly corked and labeled "poison."

2. Egg spoons get tarnished by the sulphur in the egg uniting with the silver. This tarnish is a sulphuret of silver, and may be removed by rubbing with wet salt or ammonia.

3. It may be exposed to uniform heat, and then boiled in strong alum water.

Silver, to Remove Ink Stains from.—Make a paste of chloride of lime and water and rub upon the stains.

Silver Jewelry (Filigree), to Restore the Color.—How can the original white color of silver filigree jewelry be restored when tarnished by wear or shop worn? A. First wash the articles in a solution of 1 fl. oz. of liquid potassa in 20 of water, rinse, and then immerse in a mixture of salt, 1 part; alum, 1 part; saltpeter, 2 parts; dissolved in 4 parts water. Let them remain for five minutes; wash in cold water and dry with chamois leather.

Skeletons, to Prepare and Bleach.—It is impossible to extract the oily material from the bones except by a very slow process. Boiling in any amount of alkali, say washing soda, will not accomplish it, and all the oil must be absolutely removed before you can do anything toward the bleaching. Very long maceration in water alone or in soda and water will eventually effect it, but a much better material is benzine. Make a tin box into which you pack your skeleton, solder on the cover, leaving only a round hole for filling. Pour in benzine till the box is filled, stop the hole closely, and leave it undisturbed for three months. The skeleton will come out clean, and can be bleached perfectly by sunlight. Chlorine will do the bleaching quicker, but it injures the bones; never use it. Any shorter process will give you a skeleton that is always nasty.

Silver Nitrate Stains, to Remove.—1. In the manipulation of the nitrate of silver bath solutions in photography, the operator frequently receives stains of the salt upon his clothing, which are not very attractive in appearance. Stains or marks of any kind made with the above silver solution or bath solution may be promptly removed from the clothing by simply wetting the stain or mark with a solution of bichromate of mercury. The chemical result is the change of the black-looking nitrate of silver into chromate of silver, which is whiter or invisible on the cloth. Bichromate of mercury can be obtained at the drug stores.

2. Sodium sulphite, 1 oz.; chloride of lime, ½ oz.; water, 2 oz. Mix. Use a nail brush.

3. Dip the fingers into a strong solution of cupric chloride. In about a minute the silver will be converted into a chloride, and may then be washed off with hyposulphate of soda solution.

4. The immediate and repeated application of a very weak solution of cyanide of potassium (accompanied by thorough rinsings in clean water) will generally remove these without injury to the colors.

How to Remove Nitrate of Silver Stains from the Fingers.—5. Paint the blackened parts with tincture of iodine; let remain until the black becomes white. The skin will then be red, but by applying ammonia the iodine will be bleached, leaving white instead of black stains of nitrate of silver.

6. Nitrate of silver stains may be removed by rubbing them with a weak solution of sulphydrate of ammonium or strong solution of iodide of potassium.

Soaps for Cleaning. See **Soaps.**

Stains, Soap for Removing.—Take 22 lb. of the best white soap and reduce it to thin shavings. Place it in a boiler, together with water, 8·8 lb.; oxgall, 18·25 lb. Cover up and allow to remain at rest all night. In the morning heat up gently and regulate it so that the soap may dissolve without stirring. When the whole is homogeneous and flows smoothly, part of the water having been vaporized, add turpentine, 0·55 lb.; benzine, best clear, 0·44 lb.; and mix well. While still in the state of fusion color with green ultramarine and ammonia, pour into moulds and stand for a few days before using. The product will be found to act admirably,

and the yield is very good indeed.—*Moniteur de la Teinture.*

Sponges, to Clean.—"In a large basin mix about a pint of water and 2 tablespoonfuls of sulphuric acid (common oil of vitriol), then steeped the sponge about two hours, wring it out several times in the acid, and finally well washed out the acid in clean water; it was then just like new, having regained its former size, color and elasticity, with not the slightest trace of its former sliminess. It was a large bath sponge, and in an extremely bad condition."—*English Mechanic.*

Spots and Stains, to Remove.—Taking out grease and other spots from clothes is an application of chemistry which has a practical interest for everybody. It demands a certain acquaintance with solvents and reagents, even though we may not understand the laws of chemical affinity on which their action depends. The general principle is the applying to the spot a substance which has a stronger affinity for the matter composing it than this has for cloth, and which shall render it soluble in some liquid, so that it can be washed out. At the same time it must be something that will not injure the texture of the fabric or change its color. The practical hints we shall give are condensed from a variety of foreign sources.

The best substances for removing grease or oil are; 1. Benzine. 2. Soap. 3. Chalk, fuller's earth, steatite, or "French chalk." These should be merely diffused through a little water to form a thin paste, which is spread upon the spot, allowed to dry, and then brushed out. 4. Oxgall and yelk of egg, which have the property of dissolving fatty bodies without affecting perceptibly the texture or colors of cloth. The oxgall should be purified to prevent its greenish tint from degrading the brilliancy of dyed stuffs or the purity of whites. Thus prepared it is the most effective of all substances known for removing this kind of stains, especially from woolen cloths. It is to be diffused through its own bulk of water, applied to the spots, rubbed well into them with the hands till they disappear, after which the stuff is to be washed with soft water. 5. The volatile oil of turpentine. This will take out only recent stains; for which purpose it ought to be previously purified by distillation over quicklime.

Various other receipts for removing stains will be found under grease, etc., under the same heading, **Cleansing.** The preceding table and the receipts which follow afford a ready means of determining the proper method of procedure, but the reader should not fail to look up both the name of the article and the nature of the spot, stain, etc.

The following receipts deal especially with the garment dyer: 1. Steam has the property of softening fatty matters, and thus facilitating their removal by reagents.

2. Sulphuric acid may be employed in certain cases, especially to brighten and raise greens, reds, and yellows; but it must be diluted with at least 100 times its weight of water and more, according to the delicacy of the shades.

3. Muriatic acid is used with success for removing spots of ink and iron mould upon a great number of colors which it does not sensibly affect.

4. Sulphurous acid is only used for bleaching undyed goods, straw hats, etc., and for removing fruit stains upon white woolen and silk tissues The fumes of burning sulphur are also employed for this object, but the liquid acid (or a solution of the bisulphite—not bisulphate—of soda or magnesia) is safer.

5. Oxalic acid serves for removing spots of ink and iron and the residues of mud spots, which do not yield to other cleansing agents. It may also be employed for destroying the stains of fruit and of astringent juices, and stains of urine which have become old upon any tissue. Nevertheless, it is best confined to undyed goods, as it attacks not merely fugitive colors, but certain of the lighter fast colors. The best method of applying it is to dissolve it in cold or lukewarm water, and to let a little of the solution remain upon the spot before rubbing it with the hands.

6. Citric acid serves to revive and raise certain colors, especially greens and yellows; it destroys the effect of alkalies and any bluish or crimson spots which appear upon scarlets. In its stead acetic acid may be employed.

7. Liquid ammonia is the most energetic and useful agent employed for cleaning tissues and silk hats, and for quickly neutralizing the effects of acids. In the latter case it is often sufficient to expose the goods to the fumes of this alkali in order to remove such spots entirely. Ammonia gives a violet cast to all shades produced with cochineal, lac, the redwoods or logwood, and all colors topped with cochineal. It does not deteriorate silks, but at elevated temperatures it perceptibly attacks woolens. It serves to restore the black upon silks damaged by damp.

8. The carbonate of soda (soda crystals) serves equally in most of the cases where ammonia is employed. It is good for hats affected by sweat.

9. Soda and potash only serve for white goods, of linen, hemp, or cotton; for these alkalies attack colors and injure the tenacity and suppleness of woolen and silk. For the same reason white soap is only to be recommended for cleaning white woolen tissues.

10. Mottled soaps serve for cleaning heavy stuffs of woolen or cotton, such as quilts; for such articles which do not require great suppleness or softness of feel the action of the soap may be enhanced by the addition of a small quantity of potash.

11. Soft potash soaps may be usefully employed in solution, along with gum arabic or other mucilaginous matters, for cleaning dyed goods, and especially self-colored silks. This composition is preferable to white or marbled soaps, as it removes the spots better and attacks the colors much less.

12. Oxgall, which can be obtained from the butchers in a sort of membraneous bag (the so-called gall bladder), has the property of dissolving the majority of fatty bodies without injuring either the color or the fiber. It may be used preferably to soap for cleaning woolens; but it should not be employed for cleaning stuffs of light and delicate colors, which it may spoil by giving them a greenish yellow, or even a deep green tint. It is mixed also with other matters, such as oil of turpentine, alcohol, honey, yelk of egg, clay (fuller's earth), etc., and in this state is used for cleaning silks.

13. To obtain a satisfactory result gall ought to be very fresh. To preserve it a simple method is to tie the neck of the gall bladder well with a string, and hold the bladder in boiling water for some time. This being done, it is taken out and let dry in the shade.

14. Yelk of egg possesses nearly the same properties as oxgall, but is much more costly. It must be used as quickly as possible, for it losses its efficacy with keeping. It is sometimes mixed with an equal bulk of oil of turpentine.—*Moniteur de la Teinture.*

Stearin, Sperm Candles, to Remove Spots Made by.—1. For all kinds use 95% alcohol.

2. Scrape off as much as possible with a knife, then lay a thin, soft, white blotting paper upon the spots and press with a warm iron. By repeating this the spermaceti will be drawn out. Afterward, rub the cloth where the spots have been with some very soft, brownish paper.

Stones, to Clean. — To remove grease from stone steps or passages, pour strong soda and water boiling hot over the spot, lay on it a little fuller's earth made into a thin paste with boiling water, let it remain all night, and if the grease be not removed, repeat the process. Grease may sometimes be taken out by rubbing

the spot with a hard stone—not hearthstone—using sand and very hot water, with soap and soda.

Spots of Sugar, Glue, Blood, Albumen.—On white goods, on dyed tissues of cotton and wool, and on silk, simple washing with water.

Tallow, to Cleanse and Bleach.—Dissolve 1 lb. of alum in 2 gal. of water; the water should be boiling. Now add 20 lb. of tallow and continue to boil for about an hour, skimming frequently. Strain through stout muslin and allow it to harden.

Tannin from Chestnuts, Green Walnuts, etc., or Leather.—White goods, hot chlorine water, and concentrated tartaric acid. Colored cottons, woolens, and silks, apply dilute chlorine water cautiously to the spot, washing it away and reapplying it several times.

Tannin, Walnut Shells.—White cottons and linens, Javelle water (liquor sodæ chlorinatæ), warm chlorine water, concentrated solution of tartaric acid. Colored goods or silks, chlorine water, diluted according to the tissue and color, each application to be followed by washing with water.

Tar and Pitch Stains.—Tar and pitch produce stains easily removed by successive applications of spirits of turpentine, coal tar naphtha and benzine. If they are very old and hard, it is well to soften them by lightly rubbing with a pledget of wool dipped in good olive oil. The softened mass will then easily yield to the action of the other solvents. Resins, varnishes and sealing wax may be removed by warming and applying strong alcohol. Care must always be taken that, in rubbing the material to remove the stains, the friction shall be applied the way of the stuff, and not indifferently, backward and forward.

Tar, Cart Wheel Grease, Mixtures of Fat, Rosin, Carbon and Acetic Acid.—1. On white goods, soap and oil of turpentine, alternating with streams of water. Colored cottons and woolens, rub in with lard, let lie, soap, let lie again, and treat alternately with oil of turpentine and water. Silks the same, more carefully, using benzine instead of oil of turpentine.

2. Freshly made tar stains can be removed by rubbing with lard and washing with soap and water.

Tapestry, Ancient.—Dissolve a bar of soap in 1 gal. of boiling water, when cold put 1 qt. of this dissolved soap into 1 gal. of cold water. Have ready at hand some pieces of soft flannel, a soft brush, a piece of wash leather, and some clean, dry sheets. First, well brush with a hard, long-haired clothes brush, taking care to remove all the dust from the corners; for this latter purpose it is better to use a small pointed brush and a pair of bellows. If the tapestry is on the wall begin to clean it at the top, but do not clean more than one square yard at a time.

Dip a piece of flannel into the soap liquor, squeeze it out gently, and well rub it into the tapestry to make it lather, and well brush with a soft brush. Then wring the flannel out of the soap liquor, and dry the square with the soapy flannel and the wash leather, and afterward dry with the sheets. The tapestry is to be dried with the soap in it, for on no account must it be rinsed. Dissolve 4 oz. of tartaric acid in a pint of boiling water, and put it into a pan containing 2 gal. of cold water. Dip a clean sponge into this acid water, squeeze it, and then well rub it into the spot you have just cleaned and dried. When this has been done it must be again well dried with the sheets before being left. And so proceed, a square yard at a time, until the whole is cleaned. The soap liquor must be thrown away, and a fresh lot mixed, as often as it becomes dirty. When the tapestry has all been cleaned, and it is quite dry, take a lump of pipe clay and well rub it into it, and then brush it with a clean clothes brush. This last process takes out the soap and spirits, and also brightens the colors. Keep a good fire in the room while you are cleaning the tapestry.

Tea and Coffee.—When any article has had tea or coffee spilled over it be careful not to allow soap to touch it till the stains are removed, for the alkali in the soap will make the coloring matter turn into fast dyes. Spread the stained part over a basin, and pour clean, soft boiling water through it. If the stains prove obstinate, rub in a little powdered borax, and pour on more boiling water, then place the article to soak.

Tiles, Dirty, to Clean.—They must first be well rubbed with smooth brick or pumice, to remove the injured surface, and then, after an addition of red ocher to give uniform color, when clean, dry, and free from holes, etc., pour over the floor a sufficiency of common oil of olives, such as they use in Italy everywhere for this purpose, seeing that the floors of all houses in that country are composed of tiles, which are either oiled simply or cemented smoothly, and painted over with patterns in imitation of carpet or mosaic.

Tins, to Clean.—All kinds of tins, moulds, measures, etc., may be cleaned by being well rubbed with a paste made of whiting and well water. They should then be rubbed with a leather, and any dust remaining on them should be removed by means of a soft brush. Finally, they must be polished with another leather. Always let the inside of any vessel be cleaned first, since in cleaning the inside the outside always becomes soiled. For very dirty or greasy tins, grated bath brick and water must be used.

Tobacco Pipes.—A very simple and effective plan. Cut ½ in. from the end of an ordinary cork, and fit it tightly into the bowl of the pipe. Then with a knife cut a hole through the cork wide enough to admit the nozzle of a water tap with a little pressure, turn on the water gently until the flow through the stem is sufficiently strong, and let it run until the pipe is clean.

To Clean Varnish.—Mix powdered chalk with soda or potash lye.

Colors of Varnish, Resins.—On white goods, and on dyed tissues of cotton and wool, turpentine, benzine, then soap. On silk, benzine, ether, soap; rub with care.

Vegetable Colors, Wine and Fruit Stains, Red Ink.—On white goods, vapors of sulphurous acid; hot bleaching powder solution, weak. On dyed tissues of cotton and wool, wash with warm soap water or ammonia. On silk, same; rub softly and carefully.

Veils, Black, to Clean.—1. Pass them through a warm liquid of bullock's gall and water; rinse in cold water; then take a small piece of glue, pour boiling water on it, and pass the veil through it; clap it, and frame to dry.

2. White, to Clean.—Put the veil in a solution of white soap; and let it simmer a quarter of an hour. Squeeze it in some warm water and soap, until quite clean. Rinse it from soap, and then in clean cold water in which is a drop of liquid blue. Then pour boiling water upon a teaspoonful of starch, run the veil through this, and clear it well by clapping it. Afterward dry it out, keeping edges straight and even.

Vellum.—Benzine is applied with a sponge. It will remove almost every stain, and does not destroy the texture in the least.

Velvets, Velveteens and Plush, to Clean.—1. Silk and cotton velvets, velveteens and plush, when stained or generally soiled through wear and exposure, may be either cleaned or dyed. Slightly soiled fabrics should be brushed to get rid of dust, and then be sponged with a weak solution of borax or benzine. When very much soiled they will have to be dipped in a bath of benzine, weakened by the addition of a little water. The drying should not be too rapid, but thorough. The pile must be brushed quickly he right way. But previous to brushing the

pile the back of the fabric must be stiffened. Prepare a strong solution of gum arabic in warm water. On taking the velvet or plush out of the bath dry it, and then brush the back all over with the gum. This stiffens the fabric, and prevents the pile getting loose. When dry turn over the velvet on the right side and brush it smartly, so that the pile lies upright, and in the proper direction. If this precaution of stiffening the back is not observed, the brushing will only do harm. If stiffened the pile remains firm, and can be easily brushed up. In the case of figured and parti-colored velvets, this precaution should never be omitted or the design will be spoiled. Velvet dress trimmings that are faded and greasy may be made to appear like new material by judiciously following the above directioms.

2. Velvet, to Clean or to Take Grease from.—Rub the spots on the silk lightly and rapidly with a clean, soft cotton rag dipped in chloroform, and the grease will immediately disappear without injuring the color of the silk. Repeat the operation if necessary. Be careful to rub the article rapidly and lightly, then finish with a clean, dry cloth. If these precautions are not taken, a slight stain is apt to be the result. Very highly rectified benzine, such as is prepared by first-class druggists, will also immediately remove grease from the most delicate colored silks.

Velvet, to Restore the Pile of.—Hold the wrong side of the velvet over boiling water, and the pile of velvet will be gradually raised.

Violins, to Clean.—1. Use soap and water, but avoid its running through the "*f*" holes. Clean the interior with *dry* rice. Do not use spirit.

2. Moisten the soiled parts with salad oil, then mix same oil and spirits of wine together in a basin, trying its strength first on a part of the neck or scroll, then with a piece of white linen rag, dipped in the oil and spirit, rub the soiled parts, keep shifting the rag as it gets dirty; it will take several days to do, but keep the parts well soaked where dirty with oil after every rubbing; but by no means scrape it.

3. Ordinary Paraffin Oil.—Slightly saturate a rag of soft silk, and proceed to wash your violin therewith. The effect is almost magical; the paraffin dissolves the crust of dirt and resin and cleans the varnish without injuring.

4. For the outside, a strongish solution of washing soda applied with piece of flannel. If you find the soda removes the varnish (as it does with some oil varnishes), use soap and water, and then paraffin. When clean, rub with linseed oil; spirits of wine removes the old resin at once, but sometimes takes the varnish with it. For the inside, get a handful of rice, steep it in solution of sugar and water five minutes, strain off, and nearly dry the rice till just sticky. Put in at soundholes and shake till tired. This will pick up all dirt, then turn out.

Violin Bows.—1. Take a small piece of flannel, wet it, cold process, well rub it with best yellow soap, double it, holding the hair gently between the finger and thumb, rub gently till clean, using plenty of soap, rinse flannel, wipe off, then wipe dry with a piece of calico or linen; in an hour afterward it will be ready for the resin.

2. A solution of borax and water.

Wall Papers, to Clean.—1. To remove all stains or marks where people have rested their heads, from wall papers, mix pipe clay with water to the consistency of cream, lay it on the spot, and allow it to remain till the following day, when it may be easily removed with a penknife or brush.

2. If not very dirty, the paper of any room will be much improved by brushing it over in straight lines with a soft broom, covered with a clean, soft cloth; if, however, the paper be much soiled, very stale bread is the best thing to clean it with. Cut a very stale quatern loaf into slices, and, in the lightest manner possible, wipe the paper with it in a downward direction. Clean about a yard at a time, all one way, and be careful to leave no marks. By this process very dirty paper hangings may be made to look almost like new.

Walls, to Clean Smoky.—Brush well, wash with a strong solution pearlash, rinse at once with clear water. Then give the walls when dry a thin coat of fresh slaked lime, with considerable alum dissolved in hot water added. After this has dried apply whiting and good size.

Washing Compound, Jackman's.—1. 6 lb. sal soda, 1 lb. borax, dissolve in 1 gal. boiling water. When cold, add ½ lb. potassium carbonate, 3 oz. liquid ammonia, 4 spoonfuls alcohol. Boil for five minutes ¾ lb. fresh, unslaked lime in 1 gal. water. Draw off the clear fluid when thoroughly settled. Add to this the other ingredients with 9 gal. cold water.

Directions for using: Soak the clothes overnight, after rubbing soft soap on the dirty places. In the morning add ½ pt. of the compound, ½ pt. soft soap, and 4 gal. hot water. Boil not more than five minutes, and turn into a tub, putting into your boiler the same mixture as before. Wring the clothes into this and boil again ten minutes, suds, blue, and hang them out to dry. Should the wristbands or parts that are very dirty need a little rubbing, it should be done while the mixture is boiling.

2. Wash Mixture.—Take 5 lb. bar soap, shave fine, add 1 qt. lye, ¼ oz. pearlash, dissolved over a slow fire. When dissolved, put into a vessel prepared for it to stand in; then add ¼ pt. turpentine, 1 gill hartshorn; stir well, and it is ready for use.

3. Dissolve ½ lb. soda in 1 gal. boiling water, and pour upon it ¼ lb. lime. After this has settled, cut up 10 oz. of common bar soap, and strain the solution upon it and mix perfectly. Great care must be taken that no particles of lime are poured upon the soap. Prepare the mixture the evening before washing.

Directions: To 10 gal. water add the above preparation when the water is boiling. Each lot of linen must boil half an hour, and the same liquid will answer for three batches of clothes. The white clothes must be put in soak overnight, and if the collars and wristbands are soaped and rubbed slightly, so much the better. Clean cold water may be used for rinsing. Some prefer boiling them for a few moments in clean bluing water, and afterward rinse in cold water.

4. The following compound is said greatly to facilitate the washing of clothes: Dissolve 2 lb. bar soap in about 3 gal. of water as hot as the hand can bear. Add 1 tablespoonful of turpentine and 3 of ammonia. Stir, and steep the clothes in this for three hours, keeping the vessel tightly covered. Then wash the clothes in the usual way. The soap and water may be used a second time, in which case a teaspoonful of turpentine and the same amount of ammonia must be added. This treatment is calculated to save much labor in cleansing summer clothes stained by fruit, etc.

5. The German washerwomen use a mixture of 2 oz. turpentine and 1 oz. spirits of ammonia well mixed together. This is put into a bucket of warm water, in which ½ lb. soap has been dissolved. The clothes are immersed for twenty-four hours and then washed. The cleansing is said to be greatly quickened, and two or three rinsings in cold water remove the turpentine smell.

6. Borax is valuable for laundry use, instead of soda. Add a handful of it, powdered, to about 10 gal. of boiling water, and you need use only half the ordinary allowance of soap. For laces, cambrics, etc., use an extra quantity of the powder. It will not injure the texture of the cloth in the least.

Washing Powders.—Hager, in *Phar. Centralhalle*, gives the following analyses:

1. The so-called English Washing Crystal is an impure, half efflorescent crystallized soda, containing a large proportion of sulphate of soda and common salt.

2. Under the name of Washing Crystals simply a filtered solution of borax and soda has been introduced.

3. The English Patent Cleansing Crystal Washing Powder is a half efflorescent soda, containing about 25% of Glauber's salts.

4. The Washing and Cleansing Crystals (Harper Twelvetrees & Sons) are pure crystallized soda, with 1 to 2% of borax.

5. Krimmelbein's Wool Washing Composition is a mixture of 35 parts of dried soda, 10 parts of soap powder, and 10 parts of sal ammoniac.

6. Ward's Wool Washer is a mixture of 90 parts of effloresced soda crystals with 10 parts of soap powder.

7. The Universal Washing Powder (Henkel's) is a water glass containing soda, with a small percentage of tallow soap and starch powder.

8. Hudson's Soap Extract is a mixture of crystallized soda and soda soap, containing water (soap 14·3, anhydrous soda 30, and water 55).

9. A washing powder for the finest white linen is a powdery mixture of 90 parts of effloresced soda with 10 parts of hyposulphite of soda and 2 parts of borax.

10. The so-called Finest Brilliant Elastic Starch is a mixture of about 7 to 8 parts of stearine, with 100 parts of wheaten starch (melted stearine is mixed with about fifteen times its weight of starch, and after cooling powdered and combined with the rest of the starch).

11. The Berlin Prepared Brilliant Dressing Starch is good wheaten starch, mixed with 2 to 2½% of borax.

Wax, to Clean.—Melt the wax in a jar, and put into it powdered nitrate of soda (Chili saltpeter) in the proportion of 1 oz. to the lb. of wax; afterward add, by degrees, 2 oz. to the lb. of sulphuric acid, diluted with ten times its weight of water, keeping the wax warm and stirring the while. Let it stand a short time, and then fill up the jar with hot water, and allow the whole to cool. The wax should then be white. Afterward wash with water to remove any nitric acid that may remain, as it would make the wax yellow.

Windows, Washing of.—In washing windows a narrow-bladed wooden knife, sharply pointed, will take out the dust that hardens in the corners of the sash. Dry whiting will polish the glass, which should first be washed with weak black tea mixed with a little alcohol. Save the tea leaves for the purpose.

Window Glass, Removal of Paint and Putty from.—Put sufficient saleratus into hot water to make a strong solution, and with this saturate the paint which adheres to the glass. Let it remain until nearly dry, then rub it off with a woolen cloth.

Windows, Powder for Cleaning.—1. Calcined magnesia is moistened with benzine. Apply with a rag. Mix up for use, or keep in a glass stoppered bottle.

2. Mix 1 part olive oil, 1 part ammonia, 2 parts lime, and 1 part water to a thick paste.

Wool, to Clean.—The *Leipziger Muster-Zeitung fur Faerberei*, which is likely to be good authority on such subjects, expresses its views on cleaning woolens as follows:

1. The liquid used for washing must be as hot as possible.

2. For the removal of greasy dirt, sweat, etc., borax is of so little value that its application would be mere waste. Soap lye alone is better, but the preference must be given to soap lye along with ammonia. This mixture works wonders by quickly dissolving dirt from particular parts of underclothing which are hard to cleanse. It raises and revives even bright colors, and is altogether excellent.

3. On the other hand, for cleaning white woolen goods, there is nothing which even approaches borax. Soap lye and borax, applied boiling hot, gives white woolens a looseness and a dazzling whiteness which they often do not possess when new.

4. If shrinking is to be entirely avoided, the drying must be accelerated by repeatedly pressing the woolens between soft cloths. In no case should woolens be let dry in the sun, as in this case they become dry and hard. They are best dried in a moderate current of air, and in cold weather in a warm place, not too near the stove.

5. For colored goods there should be prepared a lye of 7 qt. of soft water and 2 oz. of the best soft soap, the quantities being, of course, modified according to judgment and the dirtiness of the articles. The soap is dissolved over the fire, and the lye, properly stirred up, is divided into two vessels, to one of which is added a teaspoonful of ammonia for each quart of lye. The woolens must be entered at a heat which the hand cannot bear, and the fabric must, consequently, be turned and pressed with smooth, wooden stirrers. They are then pressed out as far as possible, and transferred to the second lye, containing no ammonia, and which by this time has become so cool that the articles can be pressed by hand, but no twisting or wringing must take place. They are then pressed between three or four soft dry towels, till the latter no longer become wet.

6. For white woolens there is added, instead of ammonia, a teaspoonful of powdered borax to each qt. of soap lye, and the operation is otherwise conducted exactly as above described. If the second lye is too soapy, it may be diluted with a little hot water.

7. After two or three lots of woolens have thus been washed, the lye must be heated again—the first lot being put aside to settle, the second being made first—with the addition of ammonia or borax, as the case may be, and fresh lye made for the second.

Zinc, Cleaning.—To clean zinc, mix 1 part sulphuric acid with 12 parts water. Dip the zinc into it for a few seconds; then rub with a cloth.

Zinc Vessels, to Clean.—Zinc articles, if small, can be cleaned by being pickled in hydrochloric acid with water added, till the articles are nicely cleaned, in about three minutes, without being too strongly attacked, then washed and dried. Large articles like refrigerators are cleaned by being rubbed with a swab, dipped in raw spirits, then washed with water, and finished with whiting.

Clearing Solutions. See **Photography.**

Cliche Metal. See **Alloys.**

Clocks and Watches, to Clean. See **Cleansing.**

Clothing, Fireproof. See **Fireproofing.**

Clothing, Oiled.—To make them, without making them sticky, they must be dried at about 150° Fah. by artificial heat. The sun will do it on a hot day. Set as much boiled oil as is necessary, mix enough lampblack to blacken them, if for black work; if yellow, use ground yellow ocher instead. Then lay the fabric on a smooth surface, and put the oil on with a brush—a shoe brush is the best, let the first coat get quite dry before putting on another. A little patent drier will make it dry quicker, say ½ lb. to a gal. of oil; if the last coat remains sticky after it is dry, give it a light coat of shellac dissolved in alcohol. Lay the oil on as thin as possible or it will not dry. Or dissolve 1 oz. beeswax (genuine) in 1 pt. boiled linseed oil, using a low heat. Rub it well in, and in general follow directions as above.

Cloths, Cement for. See **Cements.**

Cloths, to Remove Spots and Stains from. See **Cleansing.**

Cloths, to Waterproof. See **Waterproofing.**

Cloth, Tracing. See **Tracing Cloth.**

Cloth, to Prepare for Writing on.—Varnish the cloth with Canada balsam dissolved in turpentine, to which may be added a few drops of castor oil, but do not add too much, or it will not dry. Try a little piece first with a small quantity of varnish. The kind of cloth to use is fine linen. Don't let the varnish be too thick.

Clove Cordial. See **Liquors.**

Coal, Caking.—Coal which has the property of giving off abundance of gas and hardening subsequently. The caking coal is largely used in smiths' fires and for gas making.

Cobalt, to Plate with. See **Electro-Metallurgy.**

Cobbler, Sherry.—1. Put into a pint tumbler a tablespoonful of pulverized sugar, 1 gill of sherry wine, a small slice of orange, the same of pineapple, and the sunny side of a ripe peach; then fill to the brim with crushed ice. Invert another tumbler of exactly the same size upon this, being careful that the edges fit closely together; grasp the two with both hands and shake rapidly together for at least one minute, then remove the upper tumbler, pile and heap ice crushed to a fine hail upon the cobbler; make an incision in the top of this ice, in which place a sprig or two of mignonette, dust the ice slightly with rose colored sugar sand; decorate the rim of the glass with two or three roses, and at one side of the glass slip down to the bottom a large rye straw, to which apply the lips and commence to imbibe—and so gratify the senses of sight, of smell, and of taste at one and the same time.

2. One wineglass of sherry and teaspoonful of sugar, and one or two slices of orange. Fill a tumbler with shaved ice, shake well, and ornament with berries in season.

Coca and Calisaya.—Coca wine, 1 oz.; calisaya elixir, 1 oz.; orange sirup, 6 oz.

Coca Tonic for Soda Fountains.—Coca wine, 1 oz.; orange sirup, 3 oz.

Coca Wine. See **Wines.**

Coccine.—An orange scarlet dye containing, along with aurantia (bromnitro fluoresceine), the ammoniacal salt of hexanitro diphenylamine.

Cochineal.—A small insect, parasitical on the nopal, a species of the cactus, cultivated in Mexico and the Canary Islands. The females, which are by far the most numerous, have no wings, and the legs are very imperfectly developed, which gives the insect the appearance of a shriveled berry. The coloring matter of cochineal appears to have acid properties, and is known as carminic acid.

Cochineal Coloring.—The following is a good formula for preparing this coloring: Cochineal, alum, cream tartar, carb. potassa, each 3 drm.; water, 8 oz.; sugar, 6 oz. Rub the cochineal, alum and cream tartar with 8 oz. of boiling water, and when cold gradually add carb. potassa, and strain; pour water on the strainer sufficient to measure 8 fluid oz., then add the sugar.

Liquid Cochineal.—The following is from an exhaustive paper on the subject printed in *The Chemist and Druggist*, May, 1884, and is the simplest and best that has yet been given for cochineal coloring: Finest silver grain cochineal, 1 oz.; subcarbonate of potash, 1 oz.; potash alum, 1 oz.; citric acid, ½ oz.; sugar, 4 oz.; water, a sufficient quantity. Boil the cochineal (bruised) in a glass or copper vessel of suitable capacity, in 8 oz. of water, to which the subcarbonate of potash has been added. Mix loosely the alum and citric acid in powder, and add gradually to the boiling liquid, and continue to boil until effervescence has entirely ceased. While still hot filter on to the sugar, and wash the filter with hot water sufficient to make the whole measure 12 oz.

Cochineal Solution.—Dissolve 1 grm. of the cochineal in 75 c. c. of 20% alcohol. Alkalies redden it, while acids bleach it.

Cockroaches.—1. Borax is the best cockroach exterminator yet discovered. This troublesome insect has a peculiar aversion to it, and will never return where it has once been scattered. As the salt is perfectly harmless to human beings, it is much to be preferred for this purpose to the poisonous substances commonly used.

2. Mixture of red lead, Indian meal and molasses will be eagerly eaten by them and will soon exterminate them. Paris green, phosphorus, or arsenic are sometimes used, but are very dangerous. Borax, to which cockroaches have a great antipathy, will drive them away.

3. Scatter cucumber parings around the parts of the house troubled with these vermin.

4. Take 2 oz. carbolic acid and 2 oz. powdered camphor. Place in a bottle and let it remain until it becomes a fluid. Put the mixture with a small brush on the places where the roaches hide, which will bring them out at once. Then kill them.

5. Borax sprinkled about the parts where they hide will effectually drive them away.

6. Corrosive sublimate sprinkled around the places which the roaches infest will kill them quickly. Be careful, however, with this substance.

7. Make a strong decoction of poke root. When the strength is extracted, remove the roots; mix the liquor with molasses, and spread it on large platters in the places they frequent. They may thus be slain by thousands. The boiled roots laid on your closet shelves will assist in keeping them away.

8. Scatter common wafers in the places they frequent; they will eat greedily of them and be poisoned.

Cocktail, Bottle.—To make a splendid bottle of brandy cocktail, use the following: One-half brandy, ¼ water, 1 small glass of bitters (Bogart's is the best), 1 wineglass of gum sirup, ½ pony glass of curacoa. Whisky and gin cocktails, in bottles, may be made by using the above recipe, and substituting these liquors instead of brandy.

Cocoa Flake.—This is formed by grinding the nibs in a mill, consisting of two cones, working one inside the other. Pure flake cocoa is not a diluted or amalgamated article; in other words it contains no sugar, and but a trace of starch.

Cocoa Nibs.—The bruised roasted seeds, freed from husk and membrane. They ought to be of a dull red or grayish color, but are frequently given a bright red color by a coating of Venetian red.

Cocoa, Soluble.—Cocoa nibs and substances which are readily soluble or diffusible in water, ground together. Sugar, and sago or arrowroot, are the diluents used by respectable makers, but all kinds of starches, colored with Venetian red, are used for the trashy articles. The following are the principal varieties of the so-called soluble cocoa.

1. Cocoa, Granulated.—Cocoa nibs, and sufficient sugar and arrowroot to keep the fatty particles from forming a pasty mass.

2. Cocoa, Homeopathic.—A kind of soluble cocoa, prepared with arrowroot, but without sugar.

Cocoa, Maravilla.—This is stated to be the perfection of prepared cocoa. It consists of cocoa, sugar and sago flour, the last two being in great excess. No warm drink that we take approaches cocoa in its nutritive character, because while performing to a certain extent

the exhilarating work of coffee or tea, it presents to the stomach a very considerable quantity of nitrogenous and carbonaceous matter. This advantage is partly due to the fact that cocoa is taken in the form of an emulsion, instead of an infusion or decoction.

Cod Liver Oil Mixture.—It makes a really delicious emulsion. Yelks of 2 eggs; powdered sugar, 4 oz.; essence oil almonds, 2 drops; orange flower water, 2 oz. Mix carefully, and add an equal bulk of cod liver oil.—*Heder.*

Cœruleine.—A green dye obtained from galleine, on heating with a large excess of sulphuric acid. It is manufactured by Durant and Huguenin, of Bâle, and yields in dyeing and printing exceedingly fast shades on cotton. Aluminous mordants give green, iron mordants, browns, and mixtures of the two olives. The commercial paste contains 20% of the pure color.

Coffee, Arabian.—To make it in Arab fashion proceed as follows: Roast some raw nibs, and pound them down; when your water is boiling put in the coffee so treated, and stir it about. Next place the pot again on the fire, and carefully manipulate it, if occasion requires, till simmering sets in, when you must immediately remove it, and pour the contents into the cup. Milk or cream should never be added, but a little soft brown sugar may be used to suit the taste; also a little cardamom seed. Smoking a pipe of Turkish tobacco is only needed to give additional flavoring to your sips, and to transport you temporarily to the delights of the Moslem's paradise.

Coffee, Iced.—Make a strong infusion of Mocha or other good coffee; put in a porcelain bowl, sugar it properly, and add to it an equal portion of boiled milk or one-third the quantity of rich cream. Surround the bowl with powdered ice. This beverage is recommended for persons who have lost their appetite, or who experience general debility.

Coffee, Substitutes for.—These are numerous, but the principal are the following:

1. *Rye Coffee. Dillenius' ditto. Hunt's Breakfast Powder.*—Rye roasted along with a little butter, and ground to powder. A good substitute.

2. *German Coffee. Succory ditto. Chiccory ditto.*—From succory as above. *Used* either for or mixed with foreign coffee. The most common adulteration of the latter.

3. *Rice Coffee.*—From rice, as above. A good substitute.

4. *Currant Coffee.*—From the seeds washed out of the cake left in making currant wine.

5. *Gooseberry Coffee.*—From gooseberry seeds, as the last.

6. *Holly Coffee.*—From the berries.

7. *Egyptian Coffee.*—From chickpeas.

8. *Rosetta Coffee.*—From fenugreek seeds, moistened with lemon juice.

9 *Corsican Coffee.*—From the seeds of the knee holly.

10. *Sassafras Coffee.*—From the fruit or nut of the sassafras tree, or from the wood cut into chips. Very wholesome. Much recommended in skin diseases, etc.

11. *Raspings.*—The raspings of the crust of loaves procured at the baker's. Equal to rye coffee.

12. *Beechmast Coffee.*—From beechmast or nuts. Very wholesome.

13. *Acorn Coffee.*—From acorns, deprived of their shells, husked, dried, and roasted. A good substitute.

14. *Beet Root Coffee.*—From the yellow beet root, sliced, dried in a kiln or oven, and ground with a little foreign coffee. A good substitute.

15. *Bean Coffee.*—Horse beans roasted along with a little honey or sugar. When removed from the fire a small quantity of cassia buds is frequently added, and the whole is stirred until cold. Said to be a good substitute.

16. *Almond Coffee.*—Rye or wheat roasted along with a few almonds. A very small quantity of cassia buds improves it. A good substitute.

Coffee, Test for.—Add basic acetate of lead to the decoction, filter, and precipitate the excess of lead by means of sulphide of hydrogen gas, which will precipitate sulphide of lead. When evaporating the clear remaining liquid you may crystallize out the caffein, if the decoction contained real coffee. The easiest definite test to recognize the caffein is freshly made chlorine water; if this is poured on the remnant of a dried-up solution, and this dried again, it will become red as blood; as this test is very delicate, you can, if the dried-up decoction does not show this color, be sure that no coffee at all was used to make your boarding house coffee.

Coignet Beton. See **Cements.**

Coins, to Clean. See **Cleansing.**

Coke.—On an average 50 lb. of cannel coal will yield a bushel of coke.

Colcothar.—Another name for rouge, which see.

Cold Cream. See **Creams.**

Cold Sore, *Herpes labialis,* generally known as "breaking out," attacks the margins of the lips, and most frequently accompanies a cold in the head. It is too well known to need description. Treatment: Oxide of zinc, 10 parts; oxide of bismuth, 20 parts; powdered starch, 20 parts; oxide of iron, 2 parts; silica, 20 parts; oxide of aluminum, 8 parts; oxide of magnesium, 10 parts; powdered chalk, 10 parts. The above should be mixed into a fine powder, and then be made into a paste with an equal quantity of glycerine; this should be gently rubbed into and spread over the parts nightly.

Collars and Cuffs, to Wash. See **Cleansing,** *Shirts.*

Collodion.—*Blistering Collodion.*—The ethereal extract of cantharides, dissolved in collodion, forms a most convenient, active, and clearly blistering liquid. If the blister is opened at the side, the film of collodion remains unbroken; and, by thus protecting the sore, obviates the necessity of dressing it with ointment.

Collodion Cement. See **Cements.**

Colored Collodion.—1. Take of collodion, 1 oz.; annatto (pure), dragon's blood (genuine), of each 3 gr.; digest, with agitation, in a stoppered phial for 24 hours; and, if necessary, decant the clear portion.

2. Take of collodion, 2 oz.; palm oil, 1 drm.; alkanet root, q. s., 15 gr.; digest, etc., as before. This is the "Collodium Tinctum" of the Cutaneous Hospital. It dries of a good skin color; but it is not so strong as the product of the preceding formula.

Collodion. See **Photography.**

Glycerine Collodion.—Collodion, 150 parts; glycerine, 3 parts. Dissolve the glycerine in the collodion.

Colloids.—In contradistinction to crystalloids stand colloids or colloidal bodies, so named from glue, which is a familiar specimen. Bodies of this class, when reassuming the solid state, after solution, never take any regular specific geometrical form. Whether evaporated slowly or rapidly, they dry up in irregular masses, which, if struck, break up as rapidly in one direction as another. Familiar examples of colloid bodies are gelatine, gums, and albumen. They are readily separated from the crystalloids by the process of dialysis.

Cologne. See **Waters.**

Coloring of Metals. See the name of the metals, and also **Blacking, Bluing, Browning, Lacquering, etc.**

Colza Oil. See **Oils.**

Combs, to Clean. See **Cleansing.**

Combs, Lacquer for. See **Lacquers.**

Comedones. — 1. The black points, flesh worms, or comedones, which are found in the face, and especially near the nostrils, are not at all produced by the accumulation of the particles of dirt or dust, as has generally been believed, but by pigmentary matter which is soluble in acids. The following treatment has been recommended: Kaolin 4 parts, glycerine 3 parts, acetic acid 2 parts, with or without the addition of a small quantity of some ethereal oil. With this pomade cover the parts affected in the evening, and, if need be, during the day. After several days all the comedones can be easily expressed; most of them even come out by washing the parts with pumice stone soap. The same results can be obtained by bandaging the parts affected for a long time with vinegar, lemon juice, or diluted hydrochloric acid. The acids act like cosmetics, as they transform the black color into a brown and yellow shade and destroy it gradually altogether.

2. Make a pomade of kaolin, 2 parts; glycerine 3 parts; acetic acid, 2 parts; with or without the addition of a small quantity of some ethereal oil. Apply it at night. See also **Acne.**

Compositions. — *Alcarezzas, Composition for.*—1. Sandy marl, 2 parts; brine q. s.; then knead in common salt in fine powder, 1 part. Bake the pieces slowly and lightly.

2. Good clay, 2 parts; fine siliceous sand, 3 parts; brine, q. s.; common salt, 1 to 2 parts, as before. Avoid over-firing.

Carton Pierre. See **Carton Pierre** in general alphabet.

Composition to Fill Holes in Castings.—1. Dry clay, 6 parts; borax in solution, 1½ part. Mix.

2. Make a thick paste of pulverized binoxide of manganese and a strong solution of silicate of soda.

Door Plates, Composition for.—The composition is merely sealing wax run on the plates when they were hot, and then scraped off with a scraper.

Flexible Insulating Mass.—Shellac, 40 parts by weight; dry, finely pulverized asbestos, flax cotton, wood, or paper, 40 parts; wood tar, 25 parts; mineral wax (paraffin, ozocerite) 1¼ parts. Mix these ingredients together in a vessel at 160° to 200° Fah. Stir constantly. If a harder mass is desired, use less tar. For a very hard mass, put in less asbestos, and leave out the wax. Add about 30 parts ground slate or clay which does not contain iron.

Mass for Artificial Flowers and Fruits.—Mix bread crumbs, magnesia, and finely powdered starch. When fermented it can be formed and colored to any pattern. Use the lakes to color, and a solution of gamboge in alcohol for a varnish.

Gun Sights, Composition for. See **Gun Sights.**

Gutta Percha Composition.—A hard composition is made of the following: Gutta percha, 6 parts; ivory or bone dust, 2 parts; pipe clay, 1 part. It has a light color.

Insulating Compounds (Chatterton's), for Joining the Layers of G.P. in Cable Core.—Stockholm tar, 1 part; resin, 1 part; gutta percha, 3 parts.

Clark's, for Coating the Sheathing of Cables.—Mineral pitch, 65 parts; sand, 30 parts; tar, 5 parts.

Ornaments from Wood Mass.—To produce a cheap composition for moulding, mirror, and picture frames, rosettes, etc. 1. Take 12 parts whiting; 6 parts of fine sifted sawdust; 1½ parts linseed oil cake. Knead this mass to a paste with a strong solution of glue.

2. 8 parts pulverized litharge; 16 parts white lead; 2 parts fine sawdust; 20 parts plaster of Paris; stir these ingredients into 26 parts of glue dissolved in water q. s.

3. Melt 2 parts black pitch in 4 parts oil of turpentine; liquefy 4 parts glue in 4 parts of linseed oil. Mix the two together, add 4 parts of fine sifted sawdust, 4 parts whiting, and 4 parts colcothar.

4. Form a paste of the desired consistency by mixing plaster of Paris and sawdust with glue water q. s.

The moulds should be oiled, and the mass pressed carefully into them.

Pads, Composition for Padding. See **Pads.**

Patterns, Composition for. — The following composition is commonly used: Soften 12 lb. good glue in water enough to cover it, then heat until the glue is dissolved. Melt 7 lb. resin, ½ lb. pitch, and 2½ pts. linseed oil together. Stir the hot glue solution into this and add enough whiting to thicken. It should be mixed in small quantities and used at once; otherwise it will require steaming before it can be used.

Picture Frame Composition.—1. Dissolve 1 lb. of glue in 1 gal. of water; in another kettle boil together 2 lb. of rosin, 1 gill of Venice turpentine, and 1 pt. linseed oil: mix all together in one kettle, and continue to boil and stir them together until the water has evaporated from the other ingredients; then add finely pulverized whiting till the mass is brought to the consistence of soft putty. This composition is hard when cold, but when warmed can be moulded to any shape.

2. Mix 14 lb. of glue, 7 lb. rosin, ½ lb. pitch, 2½ pt. linseed oil, 5 pt. of water, more or less according to the quantity required. Boil the whole together, well stirring until dissolved, add as much whiting as will render it of a hard consistency, then press it into a mould which has been previously oiled with sweet oil. No more should be mixed than can be used before it becomes sensibly hard. Gold size is then put on, several coats being considered necessary, then the gold leaf itself, which is burnished in course of time, and finally covered with finishing size.

3. 12 parts of glue; 4 parts of litharge; 8 parts of white lead; plaster of Paris, 1 part; fine sawdust, 10 parts. Pour into sectional moulds previously coated with olive oil.

Plastic Composition.—By mixing pounded fragments of mica with a proper proportion of shellac, a composition is formed which can be moulded with ease.—*Science Record. 1874.*

Rubber Composition.—Cooper's best glue, 8½ lb.; extra sirup, 2 gal.; glycerine, 1 pt.; Venice turpentine, 2 oz. Steep the glue in rain water until pliant and drain it well. Then melt it over a moderate fire, but do not "cook it." This will take 15 to 25 minutes. Next put in the sirup, and boil for three-quarters of an hour, stirring it occasionally and skimming off impurities rising to the surface. Add the glycerine and turpentine a few minutes before removing from the fire, and pour slowly. Slightly reduce or increase the glue as the weather becomes colder or warmer.

Toys, Composition for.—Fine ground argillaceous slate, 50 per cent.; rag paper paste, 20 per cent.; and 30 per cent. of burnt plaster are mixed with the necessary volume of water to form a paste, which is then cast in moulds, the moulds having been previously daubed with finely ground slate, powdered plaster, or fat. A sufficiently thick crust will form in a few minutes, when the residuum of the mixture must be poured out of the mould. The mixture, which is unbreakable, hardens very rapidly. The castings thus produced may be immersed in paraffin or stearine, or they can be japanned. In the latter case it is desirable, so as not to consume too much paint, to first apply a coat of quick-drying boiled oil and

when the oil has become hard, the article is to be painted.

Unclassified Composition.—Five parts of sifted whiting mixed with a solution of one part glue, together with a little Venice turpentine to obviate the brittleness, makes a good plastic material which may be kneaded into figures or any desired shape. It should be kept warm while being worked. It becomes as hard as stone when dry.

Concentration.—The evaporation or volatilization of a portion of a fluid by which the strength of the remainder is increased. In pharmacy the term concentrated is applied to any liquid possessing more than the usual strength. The operation can only be performed on solutions of substances of greater fixity than the menstrua in which they are dissolved.

Concrete. See **Cements.**

Conductivity, Heat and Electrical.—

Substances.	Heat Conductivity.	Electrical Conductivity.
Silver	100·0	100·0
Copper	73·6	73·3
Gold	53·2	58·5
Brass	23·6	21·5
Zinc	19·9	....
Tin	14·5	22·6
Steel	12·0	....
Iron	11·9	13·0
Lead	8·5	10·7
Platinum	6·4	10·3
Palladium	6·3	....
Bismuth	1·8	1·9

—*Scientific American Reference Book.*

Conductivity, Electrical, of Metals.—According to Matthiessen, the electrical conductivity of the principal metals, under similar conditions, is as follows:

Silver	100·0	Platinum	18·0
Copper	99·9	Iron	16·8
Gold	80·6	Tin	13·1
Aluminum	56·0	Lead	8·3
Sodium	37·4	German silver	7·7
Zinc	99·0	Antimony	4·6
Cadmium	23·7	Mercury	1.6
Potassium	20 8	Bismuth	1·2

Confectionery, Varnish for. See **Varnishes.**

Coopers' Metals. See **Alloys.**

Copal Varnish. See **Varnishes.**

Copal, Melted.—Obtained by holding the gum before a good fire, so that as soon as the copal melts it may drop into a pan of water; a kind of oil separates from it, and the copal becomes soluble in spirits of wine, and still more so if the melting is repeated.

Copal, Powdered.—Copal reduced to powder and exposed to the air in a thin stratum, on sieves covered with paper, for three or four months. Soluble in alcohol.

Copper, Amalgam. See **Amalgam.**

Copper, to Blacken. See **Blacking Metals.**

Copper, to Bronze. See **Bronzing.**

Copper, to Brown. See **Browning.**

Copper, to Coat with Iron.—Prof. Bottger recommends the following solution for coating copper plates with iron: 10 parts of ferrocyanide of potassium and 20 parts of tartrate of soda are dissolved in 220 parts of distilled water, adding a solution of 3 parts of sulphate of iron in 50 parts of water. Caustic soda solution is poured into the mixture until the Prussian blue formed is redissolved.

Copper, Etching on. See **Etching.**

Copper, Fluxes for. See **Fluxes.**

Copper, to Gild. See **Gilding.**

Copper, Lacquers for. See **Lacquers.**

Copper, to Oxidize. See **Oxidizing.**

Copper Powder.—Copper powder used in making amalgams is prepared as follows: Mix equal parts of a saturated solution of copper sulphate with hydrochloric acid, in this place a strip of sheet zinc, the copper is thrown in fine powder; this is washed with alcohol and dried as quickly as possible.

Copper, Solder for. See **Soldering.**

Copper, Steel Gray on.—Dip the copper articles, which must be previously cleaned and pickled, into a heated solution of hydrochloric acid and antimony chloride.

Copper Sulphate.—To clean and crystallize the blue vitriol which is found in the bottom of dip jars. Dissolve in small quantity of hot water, cool slowly, and evaporate by exposure to the air.

Copper, to Weld. See **Welding.**

Copperas, Calcined.—Green copperas heated in an unglazed earthen pot until it becomes white and dry. Used as an astringent and drier and in making ink and dyeing.

Copper Dip for Cast Iron.—Sulphate of copper, 1½ lb.; dissolve and add 1 fl. oz. sulphuric acid.

Copying Drawings. See also **Photography.**—1. Copies of drawings or designs in black and white may be produced upon paper and linen by giving the surface of the latter two coatings of: 217 gr. gum arabic, 70 gr. citric acid, 135 gr. iron chloride, ¼ pt. water. The prepared material is printed under the drawing and then immersed in a bath of yellow prussiate of potash, or of nitrate of silver, the picture thus developed being afterward put in water slightly acidified with sulphuric or hydrochloric acid.

2. Joltrain's.—Black lines on white ground. The paper is immersed in the following solution: 25 oz. gum, 3 oz. chloride of sodium, 10 oz. perchloride of iron (45° B.), 5 oz. sulphate of iron, 4 oz. tartaric acid, 47 oz. water. The developing bath is a solution of red or yellow prussiate of potash, neutral, alkaline, or acid. After being exposed, the positive is dipped in this bath and the parts which did not receive the light take a dark green color; the other parts do not change. It is then washed with water in order to remove the excess of prussiate, and dipped in a bath containing acetic, hydrochloric or sulphuric acid, when all the substances which could affect the whiteness of the paper are removed. The lines have now an indigo black color. *Wash in* water and dry.

3. Blue figures on a white ground are changed into black by dipping the proof in a solution of 4 oz. common potash in 100 oz. water, when the blue color gives place to a sort of rusty color, produced by iron oxide. The proof is then dipped in a solution of 5 oz. tannin in 100 oz. water. The iron oxide takes up the tannin, changing to a deep black color; this is fixed by washing in pure water.

4. Benneden states that paper, prepared as follows, costs but ¼ as much as the ordinary silver chloride paper, is as well adapted to the multiplication of drawings and is simpler in its manipulation. A solution of potash bichromate and albumen or gum, to which carbon, or some pigment of any desired shade, has been added, is brushed, as uniformly as possible, upon well-sized paper by lamplight, and the paper is dried in the dark. The drawing, executed on fine transparent paper (or an engraving or woodcut, etc.) is then placed beneath a flat glass upon the prepared paper and exposed to the light for a length of time dependent upon the intensity of the light. The drawing is removed from the paper by lamplight, and after washing the latter with water, a negative

of the drawing remains, since the portions of the coating acted on by the light become insoluble in water. From such a negative any number of positives can be taken in the same way.—*Mechanic's Own Book.*

5. Letterpress or illustrations printed in printers' ink may be copied by simply wetting a piece of stiff paper or card and rubbing it over with an agate burnisher or old toothbrush. If the ink has got dry through age or being kept in a hot room, moisten with spirits of wine or toilet vinegar. Have a soft blotting pad beneath.

Copying Ink. See **Inks.**

Copying Pad. See **Hektograph.**

Coral, Artificial.—To 2 drm. vermilion add 1 oz. resin, and melt them together. Have ready the branches or twigs peeled and dried, and paint them over with this mixture while hot. The twigs being covered, hold them over a gentle fire; turn them round till they are perfectly smooth. White coral may also be made with white lead, and black with lampblack mixed with resin.

Coral, to Clean. See **Cleansing.**

Coralline, *Peonine, Hurine.*—Colors obtained from carbolic acid by treatment w th oxalic and sulphuric acids. They give certain deep reds verging on a scarlet, and are employed in silk and woolen dyeing and in printing. The shades produced are tolerably fast against air and light, but are readily turned yellow by acids. Peonine seems to differ from red coralline in its behavior, and is probably an amide compound. Coralline lakes are extensively employed in paper staining.

Cordage, to Protect. See **Cleansing,** *Mildew.*

Cord, Glossed. See **Twine.**

Cordials. See **Liquors and Cordials.**

Core Sand.—This sand should be coarse, porous, and very adhesive, such as rock sand, the fine material from abraded rocks; free sand from river banks, or from the seashore, and pounded blast furnace cinder, etc., are often mixed with fine, strong sand, and a little clay to make it adhesive. In each case fresh sand must be used for a core, as old sand, burnt sand, or sand mixed with coal is not advisable. 1 part clay mixed with 9 parts free sand is sufficiently strong for small and simple cores, but for large and complicated ones a stronger sand is required.

Coriander Water. See **Liquors.**

Cork Paper. See **Paper.**

Cork, to Work.—To work cork into symmetrical shapes, as pen handles, etc., cut approximately to shapes with a wet knife, using a drawing cut, and finish with a coarse emery wheel.

Corks, Cement for. See **Cements.**

Corks, Impervious (Bousquet's Patented Process).—The corks should be heated to 212° Fah., in order to kill any spores which they might contain. While the corks are hot dip them in a solution of 1 part albumen (egg or blood albumen) in 200 parts water; afterward dip in another solution composed of 1 part tannic acid, ½ part salicylic acid, and 200 parts water. Tannate of albumen is formed in the pores of the corks. Salicylic acid acts as an antiseptic.

Corks, Rubber, to Cut and Bore.—1. Dip the knife, or cork borer, in solution of caustic potash or soda. The strength is of very little consequence, but it should not be weaker than the ordinary reagent solution.

2. Alcohol is generally recommended, and it works well until it evaporates, which is generally long before the cork is cut or bored through, and more has to be applied; water acts just as well as alcohol, and lasts longer. When, however, a tolerably sharp knife is moistened with soda lye, it goes through the India rubber quite as easily as through common cork; and the same may be said of a cork borer, of whatever size. We have frequently bored inch holes in large caoutchouc stoppers, perfectly smooth and cylindrical, by this method. In order to finish the hole without the usual contraction of its diameter, the stopper should be held firmly against a flat surface of common cork until the borer passes into the latter.

Corn, to Can.—Among fruits, etc., green corn is one of the most difficult to preserve by canning. The following is the method in use by many of the large canning establishments. The corn, after removing from the cob, is filled into the clean cans so as to leave no air spaces. These are placed in a large oven, or other air-tight vessel, and subjected to hot steam under pressure. The harder the corn, the longer the exposure required to cure it; it is said that in some cases as much as eight hours is requisite, but usually much less than this. A large vessel of boiling water, in which the cans are immersed, may be used instead of the steam oven, but is not so effective. On removal from the oven or water bath, as the case may be, each can (they must be filled to the cover with fruit) has the cap with a very small hole tapped in its center immediately soldered on. As soon thereafter as the can stops blowing, as the escape of steam and air through the vent is termed, the hole is quickly soldered. This must be done before the air begins to enter. Other fruit is cured and canned in like manner—tomatoes rarely require longer than fifteen to twenty minutes steam curing. Where the pits are left in fruit a longer time is requisite to completely destroy all fermentative germs.

Corns.—A corn is an abnormal growth of the epidermis, which increases in two directions—outwardly forming a callosity; inwardly dipping into the true skin. There are two kinds, hard and soft. The hard generally form over some projecting point of bone; the soft form between the toes. Causes: Irritation by pressure or friction, as from wearing tight shoes. A piece of cotton wool should be placed between or under the toes, as the case may be, to relieve the spot from friction.

1. Salicylic acid ..... 30 grn.
   Cannabis Indica (Indian hemp) 5 "
   Castor oil..... ½ drm.
   Collodion ..... ½ oz.

Mix and apply morning and evening for four days. Then soak the feet in warm water. If this be done faithfully, the corns are removed without any difficulty. The result is a clear, light green solution. There should be no difficulty in its preparation. To prevent it from evaporating, keep the solution in a stoppered bottle. Be sure and use the Indian hemp, and not the American article; the latter is not easily soluble.

2. Pomades for Corns; Corn Salves. Savine ointment, 1¾ oz.; verdigris (in fine powder), ¼ oz. Mix.

3. Dried carbonate of soda, ½ oz.; lard, 1 oz., smalts (to color), q. s. Mix. The above are applied on a piece of rag, and renewed night and morning. Sold under various names.

4. Solvents for Corns; Corn Solvents (Liquid).—A saturated solution of salt of tartar or pearlash. It is commonly obtained by exposing the article, contained in a jar or wide-mouthed bottle, in a damp place, until it forms an oil-like liquid.

5. Caustic potassa, 1 drm.; alcohol, 1 fl. oz. Mix, in a stoppered phial, and agitate until solution is complete. The corns are either moistened with the above, or a small piece of lint, or rag, of the size of the corn, is moistened with them and then bound on, care being taken, particularly with the last one, that the liquid does not touch the surrounding parts.

Caustics for Corns.—6. Liquid terchloride of antimony, 2 drm.; tincture of iodine, 2 drm.; protiodide of iron, 7 grn. Mix, and preserve in a well stoppered phial. Apply with care. Two to four applications are said to effect a cure.

Canquoin's.—7. *a.* Chloride of zinc (powdered), 1 drm.; flour (well dried), 3 drm. Mix, and keep it in a stoppered bottle. For use, a little is made into a dough with a drop or two of warm water, which is then formed into a thin cake of the proper size and the thickness of a letter wafer and bound on the corn, where it is kept for three to six hours. After its removal, a poultice or a dressing of simple cerate should be applied. Its employment requires caution, as if left on too long it is apt to produce painful eschars. *b.* As the *last*, but substituting recently baked plaster of Paris for the flour. A very little, made into a paste with water, is spread over the corn, and, as soon as it has hardened, bound on with a piece of rag.

Lotions for Corns.—8. Sal ammoniac crushed small, ¼ oz.; proof spirit, 1 fl. oz.; essence of musk, 2 or 3 drops. Mix. The corns are to be moistened with it night and morning.

Plasters for Corns; Corn Plasters.—9. The advertised corn plasters commonly consist of resin plaster, galbanum plaster, or pitch plaster, with or without the addition of verdigris or sal ammoniac, or both of them, spread on linen, leather, or paper; the spread plaster being afterward cut into pieces of appropriate size, and "put up" in small flat boxes. The following are a few examples: Resin plaster, 5 parts; melt it by a gentle heat, stir in of sal ammoniac (in very fine powder), 1 part; and at once spread it on linen or white sheepskin.

10. Galbanum plaster, 1 oz.; verdigris (in fine powder), 1 drm; as the last.

11. Resin plaster, 2 oz.; black pitch, 1 oz.; verdigris, 1 drm.; sal ammoniac, 1 drm.

12. Argentine Corn Plaster.—Resin plaster, 7 parts; fused nitrate of silver (in fine powder), 1 part, as before. Intended as a substitute for the direct application of lunar caustic, and to be applied to the corn only.

13. Anodyne Corn Plaster.—Galbanum plaster or resin plaster, or the product of either Nos. 6 or 7, to each oz. of which 1 drm. of opium, in fine powder, has been added. Recommended for painful corns and bunions.

14. Beamish's Corn Plaster.—Said to consist of about equal parts of resin plaster and galbanum plaster, melted together by a gentle heat.

15. De Gros' Corn Plaster.—Resin plaster (recent), 5 drm.; melt it by a gentle heat, stir in of sal ammoniac (in fine powder), 1 drm.; and at once spread it on linen or soft leather. The next day, lightly brush over the surface with strong tincture of benzoin.

16. Dupret's Corn Plaster.—Resin plaster (recent), 2 oz.; beeswax (genuine), ½ oz.; olive oil, ½ oz.; melt, stir in of Croton oil, ¼ oz., and spread it before it cools.

17. French Corn Plaster; Verdigris Plaster.—Beeswax, 4 parts; Burgundy pitch, 2 parts; melt, add of Venice turpentine, 1 part; verdigris (in fine powder), 1 part; and stir the mass until nearly cold. This is the old form of verdigris plaster (emplastrum æruginis) of the Paris Codex. For use, it is spread on leather.

18. German Corn Plaster.—Galbanum plaster, 2 oz.; pitch, 1 oz.; lead plaster, ½ oz.; verdigris (in fine powder), ¼ oz.; sal ammoniac (in fine powder), ¼ oz.; and proceed as before.

19. Kennedy's Corn Plaster.—Beeswax, 3 oz.; melt, add of Venice turpentine, 1 oz.; verdigris (in fine powder), 3 drm.; and spread it on cloth. After a few hours the spread plaster is cut into pieces, and polished. Of these pieces, 1 dozen is put into each box.

20. Le Foret's Corn Plaster.—Galbanum plaster, 2 oz.; melt by a gentle heat; add of camphor (powdered), 2 oz.; sal ammoniac (in fine powder), ½ oz.; saffron (in fine powder), ½ oz.; mix thoroughly, and, when nearly cold, stir in of liquor of ammonia, 2 fluid oz.; and at once put it into bottles. It is applied, spread on leather, to the corn only, as it will blister the thin skin surrounding its base. This is the original formula. It is an improvement to use another 1 or 1½ oz. of galbanum plaster, or to add to it 1 oz. of olive oil; and also to omit one half of the camphor.

21. Mineral Corn Plaster.—Resin cerate (dry), 7 drm.; chloride of zinc (in fine powder), 1 drm.; mix, spread, and preserve the spread plasters from the air and damp. To be applied to the corn only.

22. Saxon Corn Plaster.—Galbanum plaster, 1 oz.; pitch, ½ oz.; lead plaster, ¼ oz.; melt, by a gentle heat; stir in of verdigris (in fine powder), 1 drm.; sal ammoniac (in fine powder), 1 drm.; and at once spread the mass on linen or soft leather, or form it into a roll ready for future use. This is the formula of the "*Saxon Ph.*"

Corrosive Sublimate.—Murcuric chloride. It is a deadly poison and should be used with caution. It forms an excellent exterminator of vermin.

Cosmetique (Simple).—White soft soap, ½ lb.; olive oil, 3 oz.; melt them together, add of fine sand, a small teacupful; and mould or form the mixture into cakes or balls. Shelly sea sand, sifted from the shells, washed, and dried, is the best for this purpose. Used to soften and blanch the hands, and to remove roughness and coarseness occasioned by exposure to the weather, or by gardening or other dirty work.

Cosmetics.—The following subjects and receipts are more or less directly connected with *Cosmetics*, and they will be readily found by reference to them in the general alphabet. *Abrasion, Bandoline* (See *Hair*), *Balsams, Bay Rum, Boils, Burns and Scalds, Bruises, Baths, Breath Smokers', Blisters, Bites and Stings, Cold Sores, Court Plaster, Collodion, Curling Fluid* (See *Hair*), *Chilblains, Chaps, Cosmetique, Creams Cold, Almond, Cologne* (See *Waters*), *Corns, Dandruff* (See *Hair*), *Depilatories* (See *Hair*), *Escharotics, Extracts, Essences, Eyes, Eyelashes, Hair and Hair Dye, Hands, Moles, Neavus, Nails, Oils Hair* (See *Hair*), *Powders, Pomades, Pastes, Pastils Fumigating, Poultices, Perspiration, Rouges, Smelling Salts* (See *Salts*), *Small Pox Pitting, Scalp, Tenderness of; Sachet Powders* (See *Powders*), *Skin, Sweating* (See *Perspiration*), *Teeth and Tooth Powders, Tattoo Marks, Warts, Wrinkles.*

Almond Balls, Almond Cakes.—Boules d'Amande.—1. These are used to soften the skin, and, in winter, to prevent chaps and chilblains: 1. spermaceti, 2 oz.; white wax, pure, 4 oz.; oil of almonds, pale, ½ pt. Melt them together in a glazed earthenware pipkin, or an enameled iron capsule, by the heat of a water bath, and when the mixture has cooled a little, add essential oil of almonds, 1 drm.; expressed oil of mace, 1½ drm. Stir the mixture assiduously until it begins to cool, then pour it into slightly warmed moulds, which may be ounce gallipots or egg cups, with smooth bottoms. It will then assume the form of beautiful hemispherical cakes. Very fine.

2. Hard clarified suet, 14 oz.; white wax, 2 oz.; melt; and add essential oil of almonds, 1 drm.; oil of cloves, or of pimento, ½ drm., and otherwise proceed as before. Inferior to the last, but cheaper. In using these balls, a little is well rubbed into the skin, previously washed clean and wiped dry, preferably at bedtime.

Almond Meal.—Ground almonds, 1 lb.; wheat flour, 1 lb.; orris root powder, ¼ lb.; otto of lemon, ½ oz.; otto of almonds, ¼ drm.

Almond Paste, Bitter Paste.—1. Bitter almonds and sweet almonds, equal parts; rose water, q. s. and proceed as before. No scent need be added. Both the preceding are occasionally diversified by the addition of either powdered spermaceti, in weight equal to about ⅛ part of that of the almonds, or of ⅓ this

weight of white soap. Sometimes the white of an egg is added.

2. Almond Paste, Oriental.—Peeled bitter almonds, 12 oz.; rice flour, 7 oz.; bean flour, 3 oz.; fine orris powder, 1 oz.; pulverized carbonate potassa, 4 drm.; alcoholic essence jasmine, 3 oz.; essential oil rhodium, 2 drops; essential oil neroli, 1 drop. Powder the almonds, and to prevent the separation of the oil add a little water during the trituration. The almonds being reduced to a homogeneous mass, mix in the rice and bean flours and powdered orris. Rub up well until the mixture is uniform. Dissolve the carbonate of potassa in a little water, add to the mass a little at a time, then add the jasmine and the essential oils, previously joined and well shaken together. If there is not enough liquid to make the paste of proper consistence add q. s. of rose water.

Amandine.—A preparation used to whiten and soften the skin, and also to prevent its chapping. There are three kinds, and each of these is sometimes diversified by the addition of coloring matter. 1. Transparent.—Take of finest pale honey, 4 oz.; white soft soap, 2 oz.; mix them thoroughly in a marble or Wedgwood ware mortar, adding, if necessary, liquor of potassa, 2 or 3 teaspoonfuls, so as to produce a perfectly homogeneous paste or cream. To this add and rub in, by degrees, and very gradually oil of almonds, 3½ lb., previously mixed and scented with essential oil of almonds, 3 drm.; essence oil of bergamot, 3 drm.; oil of cloves, 1½ drm.; balsam of Peru, 1½ drm.; and continue the trituration until the whole assumes the appearance of a rich transparent jelly. Lastly, put the product into pots, or dumpy, wide-mouthed bottles.

2. Opaque.—White soft soap, 3 oz.; gum mucilage, thick, clear, 4 oz.; pale honey, finest, 6 oz.; proceed as before; add the yelks of 5 large eggs, previously beaten and strained through gauze; and again thoroughly mix. Next add, very gradually, oil of almonds, 2¼ lb., scented with half of the preceding oils, etc., or at will. When the whole is perfectly blended, further add pistachio milk (thick, rich), ¼ pt., and triturate until the union is complete.

3. Glycerinated.—As either of the preceding, but adding, with the soap, ¾ to 1 oz. of glycerine for every pound of oil intended to be subsequently added. In use, a portion of amandine, about half the size of a small filbert, is rubbed with a few drops of warm water, and the resulting rich white lather applied to the hands, arms, face and neck. In a short time, and while the water on it is still milky, the skin is gently wiped with a soft napkin.

4. Almond oil, 3½ lb.; simple sirup, 2 oz. (made by dissolving 1¾ lb. sugar in 1 pt. water, boil and strain); soft soap (use the very best), 1½ oz.; otto of almonds and bergamot, ½ oz. each; otto of cloves, ¼ oz. Mix the soap and sirup, and mix in the oil gradually. Put the perfumes into the almond oil. Great care should be taken in mixing in the oil. For use, make a lather with hot water.

Emulsions.—Compounds used as substitutes for soap. They should be kept as cool as possible, and free from a damp atmosphere.

Emulsion of Almonds; Milk of Almonds; Almond Milk.—1. Sweet almonds, blanched, 1 oz.; beat them to a smooth paste, avoiding causing them to "oil," add gradually, triturating all the time, of distilled water, or clean soft water, ½ pt., and strain the liquid through gauze.

2. Blanched almonds, 5 drm.; white lump sugar, 2 drm.; gum arabic, in powder, 1 drm.; water, 8 fl. oz.; proceed as before.

3. To No. 1 add glycerine, 1 oz.

The preceding are used to soften and whiten the skin, to remove and prevent roughness, sunburn, chaps, etc. The first formula, No. 1, produces the common milk of almonds of the perfumers; the last, No. 3, is the most powerful as a cosmetic. They both keep well, and are the ones to be preferred when the emulsion is intended as a vehicle for any saline ingredient. The second and third possess advantages when oils or balsams are to be added, and are those employed in medicine. The addition of 2 to 6 bitter almonds, or of 1 to 2 oz. of rose water or orange flour water, may be made, at will, to impart odor, or, when intended for external use, to diversify the flavor, a corresponding quantity of simple water being omitted.

4. Honey and Almond Paste.—Bitter almonds blanched and ground, ½ lb.; honey, 1 lb.; 8 yelks of eggs; almond oil, 1 lb.; otto of bergamot, ¼ oz.; otto of cloves, ¼ oz. Rub the eggs and honey together first, then gradually add the oil, and finally the ground almonds, and the perfume.

5. Emulsion au Jasmin.—Saponaceous cream, 1 oz.; simple sirup, 1½ oz.; almond oil, 1 lb.; best jasmine oil, ½ lb.

6. Emulsion à la Violette.—Saponaceous cream, 1 oz.; sirup of violets, 1½ oz.; best violet oil, 1½ lb.

Eyebrow Pencil.—Suet, ½ lb.; curd soap, ¼ lb.; ivory black, q. s. Put in a metal case or roll into spills.

Freckles, Pomade for.—1. Citrine ointment, 1 drm.; oil of almonds, 1 drm.; spermaceti ointment, ¾ oz.; otto of roses, 3 drops; mix well, in a Wedgwood ware mortar, using a wooden or bone knife.

2. Take of sulphate of zinc, levigated, 20 grn.; elder flower ointment, 1 oz.; mix well in mortar.

This ointment is recommended for either summer freckles, or cold freckles, a little being applied night and morning, preceded by soap and water.

Freckles, Lotions for.—1. Bichloride of mercury, 6 grn.; hydrochloric acid (pure, sp. gr. 1·16) 1 fl. drm.; water, distilled, ¼ pt.; mix, and add of rectified spirit, 2 fl. oz.; eau de rose, 2 fl. oz.; glycerine, 1 oz.

2. Lemon (citric) acid, 3 drm.; hot water, 12 oz.; dissolve, add of red rose leaves, 1 oz.; infuse for an hour, strain with expression, and the next day decant the clear portion.

3. Red rose leaves, ¼ oz.; lemon juice, fresh, ¼ pt.; brandy or rum, ¼ pt.; digest, in the cold, for 2 or 3 hours, and otherwise proceed as before.

4. Kittoe's.—Sal ammoniac, powdered, 1 drm. troy; distilled water, 1 pt.; eau de cologne, or lavender water, 2 fl. drm.; mix. About ½ fl. drm. of hydrochloric acid increases its efficacy.

5. White soft soap, 3 oz.; gum mucilage thick and clear, 4 oz.; finest pale honey, 6 oz. Mix thoroughly in a mortar, add the yelks of 5 eggs previously beaten and strained through gauze, add slowly oil of almonds, scented to taste, 2¼ lb. When perfectly mixed add pistachio milk, made from fresh peeled nuts and rose water, ¼ pt., and rub up until completely mixed. This is corrosive, and acts by removing the outer cuticle.

6. A Good Remedy for Removing Freckles.—Sulphocarbolate of zinc, 1 oz.; glycerine, 12 oz.; rose water, 12 oz.; alcohol, 3 oz.; spirits of neroli, ½ drm. Mix them. To be applied twice a day, leaving them on from half an hour to one hour.

The following is recommended by the *Druggists' Circular* as a preparation for this purpose which does not contain mercury: ammonium chloride, 1 drm.; distilled water, 7 oz.; cologne water, 2 drm.

Freckles, a Remedy for.—1. The following is quoted by *New Remedies* from a German medical journal: Sulphocarbolate of zinc, 2 parts; glycerine, 25 parts; rose water, 25 parts; spirits, 5 parts. Dissolve and mix.

The freckled skin is to be anointed with this twice daily, the ointment being allowed to stay on from one half to one hour, and then washed off with cold water. Anæmic persons

should also take a mild ferruginous tonic. In the sunlight a dark veil should be worn.

2. Scrape horse-radish into a cup of cold sour milk, let stand twelve hours, strain, and apply two or three times a day.

Hydrokinone Wash for the Skin.—

Hydrokinone	gr. xlviii.
Acid phosphoric glac	gr. xxx.
Glycerine	dr. ii.
Aqua dest	oz. vi.

Misce.

These two lotions are stated to give excellent results, especially the latter. They are to be applied to the skin of the face, etc., in the usual way at least twice in the course of twenty-four hours, after it has been washed and dried carefully. If the skin be of the nature known as "greasy;" a preliminary wash with tepid water containing a few drops sal volatile or liq. ammon. fort. is advisable.

Albadermine.—Under this empirical title, a process of removing "tan" and the milder variety of "freckles," a foreign surgeon has devised the following:

Solution A.

Potass. iodid	drm. ii.
Iodine pur	gr. vi.
Glycerine	dr. iii.
Infus. rosæ	oz. iv.

Dissolve the iodide of potassium in a small quantity of the infusion and a drm. of the glycerine; with this fluid moisten the iodine in a glass mortar and rub it down, gradually adding more liquid until complete solution has been obtained; then stir in the remainder of the ingredients, and bottle the mixture.

Solution B.

Sodæ hyposulph. thiosulphate	oz. iss.
Aqua rosæ exot	pt. i.

Dissolve and filter.

With a small camel's hair pencil or piece of fine sponge apply a little of "Albadermine A" to the tanned or freckled surface, until a slight but tolerably uniform brownish yellow skin has been produced. At the expiration of fifteen or twenty minutes moisten a piece of cambric, lint, or soft rag with "B," and lay it upon the affected part, removing, squeezing away the liquid, soaking it afresh, and again applying until the iodine stain has disappeared. Repeat the entire process thrice daily, but diminish the frequency of the application if tenderness be produced. In the course of three to four days to as many weeks the freckles will either have disappeared entirely or their intensity will be greatly diminished. "Summer freckles" yield *very* speedily to this treatment.

Anti-Freckle Lotion.—

Hydrarg. bichlor	gr. xii.
Acid hydrochlor. pure	drm. iii
Fruct. amygd. amar	oz. iss.
Glycerini, Price's	oz. i.
Tinct. benzoin	drm ii.
Aqua flor. aurant.	q. s.

Dissolve the corrosive sublimate in 3 oz. of the orange flower water, add the hydrochloric acid, and set aside. Blanch the bitter almonds, and bruise them in a Wedgwood mortar, adding thereto the glycerine and using the pestle vigorously; a smooth paste is thus obtained. Then add gradually about 9 oz. of the orange flower water, stirring constantly, continuing this operation until a fine, creamy emulsion is the result. Subject this to violent agitation—preferably with the aid of a mechanical egg whisk—and allow the tincture of benzoin to fall into it the while drop by drop. Then add the mercurial solution, filter, and make up the whole to the measure of 1 imperial pt. with more orange flower water.

This preparation is recommended to us by an eminent dermatologist as being invariably efficacious in the treatment of ephelis, and always greatly ameliorating lentigo, even if it does not entirely decolorize the patches in the latter case. A general whitening of the skin is produced by this lotion without any irritation. It is as well, however, not to apply it to any abraded surfaces. It has been found far superior in practice to a preparation—which it somewhat resembles—sold at a high price in Paris under the name of *Lait Antiphelique.*

Bismuth Ointment for Freckles,—

Bismuthi subnit	drm. iii.
Ung. simp	oz. ii.

Fiat ung.

Apply to face, etc., at night, and remove in the morning with a little cold cream previous to washing. This is from a private American source.

Copper Oleate for Freckles, etc.—This is a much more effective and reliable ointment for the purpose than the preceding, which is really only suited for the milder form of sunburn, while the oleate of copper will remove the more persistent and obstinate lentige. It is thus prepared:

Cupri oleas, ver	oz. i.
Petrogell. alb. Burgoyne's	oz. iii.

Incorporate thoroughly without heat.

This is to be applied in the same manner as the preceding, washing the surface of the skin, however (after the cold cream), about every third morning, with a little weak ammonia water in order to prevent any inadvertent accumulation of copper.

Cosmetic Gloves.—Mock kid or lamb skin gloves rubbed over, on the inside, with a composition of the following kind: Spermaceti cerate (hardest, melted), 5 oz.; balsam of Peru, 1 drm.; stir for five minutes, pour off the clear portion, add of oil of nutmeg, ½ drm.; oil of cassia, 12 to 15 drops; essense of ambergris, 12 to 15 drops; and stir the whole until cold. Worn by ladies in bed, at night, to soften and blanch the hands, and to prevent and cure chaps and chilblains.

Glycerine for Toilet Use, Solidified.—Transparent soap, 1½ oz.; water, 6 oz.; inodorous glycerine, 36 oz. Dissolve the soap in the water by heat, add an equal weight of glycerine. When dissolved, add the rest of the glycerine, water q. s. to make up the weight. When nearly cold add any perfume desired. Put in glass jars. It is of a pale amber color, and is transparent.

Lotions.—These preparations, popularly called "washes," are local external applications consisting of water, or some simple aqueous vehicle, holding in solution medicinal or cosmetic substances. Medicinal lotions are usually applied by wetting a piece of linen with them, and keeping it on the part affected; cosmetic lotions, by simply moistening the skin with them.

Acetic Lotion.—Take of good strong vinegar, 1 part; water, 2 or 3 parts; mix. In bruises, contusions, sprains, etc., and as a general refrigerant wash or lotion to sound parts; also to remove freckles.

Lotion of Acetate of Lead.—Take of sugar of lead, ¼ oz.; distilled or soft water, 1 pint; dissolve. Sometimes a little vinegar is added, a like quantity of water being omitted. Used in excoriations, burns, sprains, contusions, etc.; also as an occasional cosmetic wash by persons troubled with eruptions.

Lotion of Acetic Acid for Baldness.—The following lotion is superior for a shampooing liquid, for removing dandruff, and as a useful and pleasant application for baldness. It is, of course, moderately stimulating, and in those cases in which the hair follicles are not destroyed, but have become merely inactive, it is likely to prove efficacious. Take of acetic acid, 1 drm.; Cologne water, 1 oz.; water, to make in all 6 oz.

Alum Lotion.—Take of alum (crushed), 1½ drm.; distilled or soft water, 1 pt.; dissolve. A little rose water may be introduced to scent it.

Arsenical Cosmetic Lotion.—1. Take of arsenious acid (solid or crystallized), 3 to 5 grn.; crush it to a fine powder, place it in a jug or basin,

pour on it of distilled or soft water (boiling), ¾ pt.; and promote solution by constantly stirring the liquid for some time with a small glass rod or a clean piece of wood. After repose, and when cold, pour off the clear solution into a clean bottle, carefully observing not to disturb the sediment or any undissolved portion, which must be entirely rejected. To the clear liquid add, of eau de rose (foreign), 1 oz.; glycerine (Price's), 1 oz.; and after mixture, by agitation, further add enough cold distilled water or pure soft water to make the whole measure exactly one pint. It should then be poured into 5 oz. or 6 oz. bottles, only one of which, for safety, should be kept out for use.

2. As the last, but adding, with the arsenious acid, an equal weight of carbonate of potassium. This addition facilitates the solution of the former, but the product is said to be slightly less effective as a cosmetic wash.

3. Solution of arsenite of potassa, 1 fl. oz.; eau de rose, 1 fl. oz.; glycerine (Price's), ½ oz.; distilled or pure soft water (cold), 1 pt.; mix. A convenient formula, but less esteemed than No. 1.

Lotion of Bichloride of Mercury.— Corrosive sublimate (in coarse powder), 10 grn.; distilled water, 1 pt.; agitate them together until solution is complete. The addition of 5 or 6 grn. of pure sal ammoniac or 5 or 6 drops (not more) of hydrochloric acid, increases the solvent action of the water, and renders the preparation less liable to suffer change, but it is not otherwise advantageous. When absolutely pure distilled water is not used, this addition of acid should be made to prevent decomposition. Some persons dissolve the sublimate in 2 or 3 fluid drm. of rectified spirit before adding the water, to facilitate the process; but this also, though convenient, is unnecessary. This is a deadly poison.

Lotion of Borax.—1. Borax (powdered) 2½ drm.; distilled water, ½ pt. Mix. An effective wash for sore gums, sore nipples, excoriations, *etc.*, applied twice or thrice daily, or oftener.

2. Borax (powdered), 3 drm.; glycerine, ¾ oz. rose water or elder flower water, 12 oz. Mix.

Cherry Laurel Lotion, Cherry Laurel Shaving Wash.—Cherry laurel water (genuine, distilled), 2 fluid oz.; rectified spirit, 1 fluid oz.; glycerine, ½ oz.; distilled water, 7½ fluid oz. Mix. Used to ally irritation of the skin, particularly after shaving, the part being moistened with it by means of the tips of the fingers; also used as a wash for freckles and acne, and to remove excessive moistness or greasiness of the hair.

Lotion of Chlorate of Potassium.—Take of chlorate of potassium (powdered) ½ oz.; distilled water, ½ pt.; rose water, 4 oz.; glycerine, 1 oz. Dissolve.

Face Lotion.—As a face lotion, oatmeal made in a paste with glycerine 2 parts, water 1 part, and applied to the face at *night*, *with* a mask worn over, will give in a short time, if faithfully pursued, a youthful appearance to the skin.

Freckles, Lotion to Remove.—Alum and lemon juice, of each 1 oz.; rose water, 1 pt. Bathe the face three or four times daily.

Glycerine Lotion.—1. *Glycerine (pure)*, 1 oz.; distilled or pure soft water, 19 oz. Mix. A good strength for daily use as a cosmetic wash, or as a vehicle for other ingredients, for which purpose it is greatly preferable to milk of almonds; also as a lotion to ally itching and irritation of the skin, prevent chaps, excoriations, the effects of weather, climate, etc. It is likewise applied to the hair instead of oil.

2. Glycerine, 1 oz.; distilled water, 9 oz. Mix. A proper strength when more marked effects are desired; as in chapped hands, lips, nipples, obstinate excoriations, abrasions, chafings, sun burns, persistent roughness or hardness of the skin, etc.

Lotion, Emollient Glycerine.—Take of mucilage of quince seeds, 6 fl. oz.; glycerine, 1 fl. oz.; orange flower water, 1 fl. oz. Make a lotion.

Gowland's Lotion.—Jordan almonds (blanched), 1 oz.; bitter almonds (do.; say 7 to 9), 2 to 3 drms.; distilled water, ½ pt.; form them into an emulsion. To the strained emulsion, with agitation, gradually add of bichloride of mercury (in coarse powder), 15 grn.; previously dissolved in distilled water, ½ pt.; after which further add enough distilled water (2 or 3 teaspoonfuls) to make the whole measure exactly 1 pt.

Horse Radish Lotion (for the skin).—Horse radish root, 1½ oz.; boiling water, 1½ pt.; borax, 3 drm. Used for freckles, tan, etc.

Lotion of Iodide of Potassium.—Iodide of potassium, 1 to 2 drm.; distilled water, 1 pt.; dissolve.

Glycerine Lotion for Irritation of the Skin.—Mix 1½ oz. glycerine with 1½ pt. water. Allays itching, removes dryness, etc. For chapped hands or lips, add 3 or 4½ drm. borax.

Lemon Juice Solution.—Fresh lemon juice, 2 oz.; glycerine, 1 oz.; rose water or rain water, with 3 or 4 drops otto of roses added, 1 pt. Anoint the hands and face three or four times daily, and allow to remain on several minutes before wiping. For clearing the complexion, and making the skin white and soft.

Mosquito Lotion.—Aqua ammonia, 2 oz.; glycerine, 1 oz.; rose water, 8 oz.

Sulphureted Lotion.—1. Sulphuret of potassium, 1 drm.; distilled water, 1 pt.; dissolve. Used to render the skin soft, white, and smooth, particularly when there is a tendency to slight eruptions of a pustular or vesicular character. ½ to 1 oz. glycerine improves it for present use.

2. Sulphide of potassium, 1½ drm.; water, ½ pt.; dissolve. A cleanly and effective remedy for itch, used twice or thrice daily. It does not soil the linen and leaves very little smell.

3. (Cazenave.) Sulphuret of potassium, 1 drm.; white soft soap, 2 drm.; water, 8 oz.; dissolve. Used as the last; also to destroy pediculi.

Sun Burn Lotion.—1. 2 drm. tincture of benzoin and 2 oz. rose water. Mix and shake well. This is an excellent recipe for sun burns.

2. Acid citric..... 1 drm.
Ferri sulphas *pur*.....18 grn.
Camphora. ..... .q. s.
Aq. flor. sambu.... . .. . 3 oz.

The sulphate of iron must be in clear green crystals, unless the granulated form, which is preferable, be available, and in either case the salt should be fresh and free from oxidized portions, or "rustiness;" it should be dissolved in half the elder flower water (all of which is better, if not quite recently distilled, for being quickly raised to the boiling point and cooled out of contact of air before use), the citric acid being also in solution in the other half, and the two fluids mixed, filtered if necessary, and bottled immediately, a lump of camphor about the size of a small peppercorn to be added to the contents of each bottle.

Milk of Roses.—English Milk of Roses.—1. Almonds (blanched), 1½ oz.; oil of almonds, 1½ oz.; white soft soap, 1 drm.; rose water, ¾ pt.; make an emulsion; to the strained emulsion add a mixture of essence or spirit of roses, ½ fl. drm.; rectified spirit, 2½ fl. oz.; and, subsequently, of rose water, q. s. to make the whole measure 1 pt. More spirit is often ordered and used; but much of it is apt to cause the separation of the ingredients. In many samples, and in the inferior ones generally, it is omitted altogether. Some makers add a few drops of oil of bergamot, with 2 or 3 drops each of oil of lavender and otto of roses, dissolved in the spirit.

2. Oil of almonds, 1 oz.; white soft soap, 1 oz.; salt of tartar, ½ drm.; boiling water, ¼ pt.; triturate and subsequently agitate until perfectly united. When cold, further add, of rectified spirit, 2 fl. oz.; spirit of roses, a few drops; rose water, q. s. to make the whole measure a pint. The above are used as cosme-

tic washes in a similar way to Gowland's lotion; also to remove scurf, freckles, and acne and other pimples, and eruptions, in slight cases.

French Milk of Roses.—1 tincture of benzoin (simple), ½ fl. oz.; tincture of styrax, ¼ fl. oz.; esprit de rose, 1 to 2 fl. drm.; rectified spirit, 2½ fl. oz.; mix, and add gradually, with agitation, of rose water, 16½ fl. oz.

German Milk of Roses.—Dilute solution of diacetate of lead, ½ fl. oz.; lavender water, 2 fl. drm.; rectified spirit, 2½ fl. oz.; rose water, ¾ pt.; mix, with agitation. The spirit is often improperly omitted, or less is used. It is cooling and astringent, and is employed as a wash, like the preceding; as also in moist eruptions, excoriations, etc.; but it is more active, and less fitted for very frequent use.

Milk of Almonds.—Bitter almonds, blanched, 10 oz.; distilled (or rose) water, 1 qt.; alcohol (60 over proof), ¾ pt.; otto of almonds, ¼ drm.; otto of bergamot, 2 drm.; wax, spermaceti, almond oil, curd soap, each ½ oz.

Milk of Dandelion.—Sweet almonds, 4 oz.; rose water, 1 pt.; expressed juice of dandelion root, 1 oz.; esprit de tuberose, 8 oz.; green oil, wax, curd soap, each ½ oz. Let the juice of the dandelion be perfectly fresh pressed.

Milk of Elder.—Sweet almonds, 4 oz.; elder flower water, 1 pt.; alcohol (60 over proof) 8 oz.; oil of elder flowers prepared by maceration, ½ oz.; wax, sperm, soap, each ½ oz.

Olivine.—Gum acacia, in powder, 2 oz.; honey, 6 oz.; 5 yelks of eggs; white soft soap, 3 oz.; olive oil, 2 lb.; green oil, 1 oz.; otto of bergamot, 1 oz.; otto of lemon, 1 oz.; otto of cloves, ½ oz.; otto of thyme and otto of cassie, each ½ drm. Rub the gum and honey together until incorporated, then add the soap and egg and mix the green oil and perfumes with the olive oil.

Pastes.—In cosmetics, perfumery, and pharmacy the term paste is not confined to semi-solid and more or less tenacious, moist preparations, but is very loosely applied to a variety of articles differing widely from each other, including even certain powders. It is, therefore, impossible to class them correctly together, as the reader will perceive by reference to individual formulæ bearing this general name in the subsequent portion of this work.

Sunburn.—Often in exposed situations, as at the seaside, the skin may become not only sunburned in the common sense of the word, but irritable and inflamed. The following used twice daily as a wash will prevent this: Milk, 20 oz.; carbonate of soda, 1 oz.; glycerine, 1 oz.; powdered borax, ½ oz. Or the following: Carbonate of soda, 1 oz.; oatmeal water, ½ pt.; milk, ½ pt.

Tan and Sunburn, to Remove. See also *Freckles.*—The following is recommended: 6 drm. avoirdupois powdered borax: Price's glycerine, ¾ oz.; use water or elder flower water, 12 oz.; mix. We doubt the efficacy of any application except such as will cause the outer layer of the skin to strip off, such as the extract of cashew nuts. Even such a violent application does little good if the skin is re-exposed to the sun, as sunburn and freckles are liable to return as badly as ever.

Sunburn.—Take 6 drm. avoirdupois powdered borax, pure glycerine, ¾ oz., rose water or elder flower water, 12 oz.; mix. Its daily use as a cosmetic wash renders the skin beautifully soft and white, and prevents and removes chaps, sunburns, etc.

See also *Lotions* above.

Cosmolin.—Cosmolin and vaselin are variable mixtures of paraffin with volatile oils. It is the residue left from the distillation of petroleum purified by filtration over animal charcoal, says Miller.

Cotton, Absorbent. See **Absorbent Cotton.**

Cotton, to Dye. See **Dyeing.**

Cotton, to Gild. See **Gilding.**

Cottonseed Oil. See **Oils.**

Cough Medicines.—A few simple receipts for expectorants, useful for winter coughs. The first is particularly suitable for young children.

1. Sirup of squills; 1 fluid drm.; gum acacia, powdered, ½ fluid drm.; ammonium chloride, 8 grn.; peppermint water, enough to make 2 fluid oz. Dose for a child, a teaspoonful every two hours.

2. Another formula, for older children and adults, consists of sirup of ipecac, 2 parts; sirup of squills, 4 parts; paregoric, 1 part. Dose, half to one teaspoonful, repeated as often as necessary.

3. The following was a favorite prescription of Prof. C. A. Lee, of Peekskill: Sirup of ipecac, 1 oz.; sirup of tolu, 1 oz.; paregoric, ½ oz.; sirup wild cherry, 1 oz.

4. For hoarseness, Dr. Eichelberger gives the following, which he says is very good for hoarseness: Tincture chloride of iron, 2 drm.; glycerine, 4 drm.; water, 4 drm. Dose, half a teaspoonful, occasionally.

5. (Draughts.) *a.* Sirup of poppies, 1 dessertspoonful; antimonial wine, 20 drops; mix for a dose, to be taken in a little warm tea on going to bed. *b.* Laudanum, 30 drops; vinegar and honey, of each a dessertspoonful; ipecacuanha wine, 25 drops; mix for one dose, as last.

6. (Emulsion.) Milk of almonds, 4 oz.; sirup of squills and tolu, of each 1 oz.; mix. Dose, a tablespoonful every two hours.

7. (Mixtures.) Tincture of tolu, ¼ oz.; paregoric elixir and tincture of squills, of each ½ oz.; sirup of white poppies, 1 oz.; mix. Dose, 1 teaspoonful in barley water, whenever the cough is troublesome.

8. Milk of ammoniacum, 4 oz.; sirup of squills, 2 oz.; mix. A tablespoonful three or four times daily, for the cough of old persons.

9. (Dr. Munro's.) Paregoric, ½ oz.; sulphuric ether and tincture of tolu, of each ¼ oz.; mix. Dose, a teaspoonful night and morning, or when the cough is troublesome, in a little warm water.

10. (Dr. Radcliff's.) Sirup of poppies, sirup of squills, and paregoric, of each ½ oz.; mix. Dose, as last.

Coughing, to Relieve.—In severe paroxysms in coughing, either in coughs, colds, or consumptives, one or two tablespoonfuls of pure glycerine in pure rye whisky or hot rich cream will afford almost immediate relief; and to the consumptive a panacea is found by daily use of glycerine internally, with the proportion of 1 part of powdered willow charcoal and 2 parts of pure glycerine.

Court Plaster.—1. Gold beater's skin, without any preparation, forms the very best court plaster that can be employed. A piece of it applied (dry) to the slightly moistened skin, and held there for a few seconds, with the hand, will adhere firmly for several days, or until the part be wetted; and, from being transparent and almost colorless, will, when of the finest quality and skillfully applied, be scarcely visible.

2. Isinglass (best, genuine), 1 oz.; water, ½ pt. Dissolve by heating them together in a covered vessel; strain the solution, and when only lukewarm add to it gradually, but quickly, a mixture formed of rectified spirit, 2 fl. oz.; tincture of benzoin, 2 fl. oz. Apply this composition (still warm) by means of a flat camel hair brush, or any appropriate "spreader," to the surface of silk, or sarcenet, stretched in a frame, repeating the application as soon as the preceding coating is dry, and again as often as necessary (six to twelve times). Lastly, when quite dry and hard, give the prepared surface a "finishing coat" with a solution of Chio turpentine, 1 oz.; dissolved in tincture of benzoin, 2 fl. oz. Tincture of balsam of Peru, or of styrax, may be substituted for the tincture of

benzoin; and a few drops of essence of ambergris, or of musk, may be added to increase the fragrance of the compound. Some parties simply employ one or other of the above tinctures for the finishing coat; and others apply it to the unprepared side of the silk, by which the plaster is rendered partially waterproof, but the appearance of its exposed surface injured. Care should be taken that the first two or three applications of the gelatine composition do not sink into the silk, so as to appear on the right side, which will not be the case if it be only sufficiently warm to remain liquid, and be applied very thinly and rapidly, and with a light stroke of the brush or spreader.

3. Deschamp's.—Apply to the stretched silk a very thin coating of smooth, strained flour paste; and over this, when dry, two or three coats of warm size, made with colorless gelatine and water, to which some odorous tincture or essence has been added. Said to be superior to the ordinary court plaster, and much of the court plaster of commerce is so prepared.

4. Liston's.—Isinglass, 1 oz.; water, 2½ oz. Keep them in a covered vessel, in a hot place, until the isinglass has swollen and absorbed all the water, and become quite soft; then beat it to a uniform semifluid mass, strain it by squeezing it through muslin, and add of proof spirit, 3½ fl. oz. Next expose the mixture, with frequent stirring, in a covered bottle or other vessel, until the union be complete. Lastly, with a brush, apply four coats of the solution to the surface of oiled silk stretched out and nailed on a board. A little of the tinctures or essences before noticed may be added to impart a slight odor to the plaster.

Coverings for Boilers. See **Boiler Coverings.**

Cracks in Metal.—A crack in a piece of metal is prevented from extending further by the well-known means of drilling a hole where the rent ends; but when the hole is not bored on just that spot, the crack is apt to continue beyond the hole. To facilitate the search for the exact point, *Revue Industrielle* recommends moistening the cracked surface with petroleum, then wiping it and immediately rubbing it with chalk. The oil that has penetrated into the crack exudes, and thus indicates with precision where the crack stops.

Crape, to Clean. See **Cleansing.**

Crayons.—Small cylinders or pencils of coloring substances, used for drawing upon paper, etc. Prep. Crayons are commonly prepared by mixing the color with some substance that will dilute it to a proper shade, and give it the necessary softness and tenacity to adhere readily to paper, when rubbed against it. The cylindrical form is generally given to them by means of a cylinder of 2 or 3 in. diameter, having one end open, and the other firmly secured to a perforated plate having holes of the same size as the intended crayons. The crayon composition, in the state of a stiff paste, is introduced into the open end, and is driven down and through the holes, by means of a small plug or piston, that exactly fits the inside of the cylinder. To impart an equable motion, which is essential to the formation of well shaped crayons, a small screw is employed. The pieces that pass through the holes are cut into lengths and dried. All the materials employed in making crayons are previously reduced to the state of an impalpable powder, and those that are gritty are elutriated or washed over. The following are among the best formulæ for making crayons:

1. Spermaceti, 3 oz.; boiling water, 1 pt.; agitate together till they form a species of emulsion, with which mix up bone ashes 1 lb. (previously reduced to an impalpable powder), and coloring matter as much as is required to give the proper tint. When half dry form the mass into crayons.

2. Pipe clay, and the finest prepared chalk, equal parts; or pipe clay alone, q. s.; coloring a sufficient quantity. Make them into a paste with pale mild ale.

3. Washed pipe clay and washed chalk equal parts, mix them into a paste with sweet ale made hot, and with a chip or two of isinglass dissolved in it.

4. Take common pipe clay in powder, mix it up into a paste with very strong soapsuds, made thus: Cut up 1 oz. of white soap into small shavings, dissolve it over the fire in ½ pt. water, stir into the mixture while hot the powdered pipe clay as long as you can stir it. Spirits of wine added before the powders, to render the soap water transparent, is an improvement.

5. Melt 3 oz. of shellac in 2 oz. of spirits of wine; this will form a thick liquid; to this add 6 parts of pipe clay and 1 part of oil of turpentine; grind all well together. The lighter the color of the shellac, the better; also if colors are to be added they should be ground up with the turpentine, before this is added to the rest.

Crayons, Drawing.—Pale shellac, 5 parts; wood naphtha, 12 parts; dissolve and with this fluid mix up the coloring powder. Dry by stove heat.

1. Black Crayons—Use black lead, ivory black, lampblack.
2. Blue—Indigo, Prussian blue or smalts.
3. Brown—Umber or brown ocher.
4. Green—Mix king's yellow, or
5. Yellow ocher with blues.
6. Purple—Use bright blue or carmine.
7. Red—From carmine or vermilion.
8. White—From pure clay and chalk.
9. Yellow—From Naples or king's yellow.

Lithographic Crayons.—White wax, 4 parts; gum lac, 2 parts; melt over a gentle fire; then add dry soap shavings, 2 parts; stir until dissolved, and add white tallow, 2 parts; copal varnish and lampblack, each 1 part; continue the heat and stirring until a cooled sample will bear cutting to a fine point.

Lithographic Chalk.—Common soap, 1½ oz.; tallow, 2 oz.; virgin wax, 2½ oz.; shellac, 1 oz.; lampblack, ¼ oz. Mix as for lithographic ink.

Senefelder's Composition for Crayons, — 1. Black, 2 parts; soap, 6 parts; wax, 4 parts.
2. Black, 2 parts; soap, 4 parts; wax 8 parts.
3. Black, 2 parts; soap, 4 parts; wax, 4 parts; spermaceti, 4 parts.
4. Black, 2 parts; soap, 4 parts; wax, 8 parts; spermaceti, 4 parts.
5. Black, 3 parts; soap, 5 parts; wax, 8 parts; shellac, 4 parts.
6. Black, 3 parts; soap, 5 parts; wax, 8 parts; tallow, 2 parts; shellac, 4 parts.
7. Black, 3 parts; soap, 6 parts; wax, 8 parts; tallow, 4 parts.

These are made in precisely the same manner as the ink, and may be made by the same materials if they are burned sufficiently hard for use in drawing. These various recipes of Senefelder's will yield a great variety of crayons by burning them more or less. Crayons may be cast in a flat cake, and then cut up with a saw or hot knife, into square pencils, but they are better cast in a grooved box similar to a druggist's pill machine, and pressure applied while hot.

Crayons for Writing on Glass.—1. French chalk cut into suitable pieces. Marks made with these crayons when obscured or rubbed out may be several times revived by simply breathing on the glass.

2. Spermaceti, 4 parts; tallow, 3 parts; wax, 2 parts, are melted together in a cup, and red lead, 6 parts, and carbonate of potassa (in fine powder), 1 part, stirred in; the mass is kept melted and stirred for about half an hour longer, then poured into glass moulds (tubes) of the thickness of a common pencil, and cooled as rapidly as possible. The mass may be screwed up and down in the tube and cut to a point with a knife. A crayon is thus ob-

tained which will readily write on clean, dry glass.

Craze.—Term applied to the cracking of the glaze of pottery and porcelain.

Cream, Painters'.—Pale nut oil, 6 oz.; mastic, 1 oz.; dissolve; add ¼ oz. of lead acetate, previously ground in a small quantity of oil; then further add water q. s. gradually until it acquires the consistency of cream. It is used by painters to cover work temporarily as it can be washed off.

Creams.—*Cream, Almond* (Creme d'Amandes).—Lard, perfectly pure and fresh, 220 parts; solution of potassa, containing 26% of caustic potash, 120 parts; alcohol, 60%, 10 parts; oil of bitter almonds, q. s. Triturate in a porcelain or Wedgwood mortar the lard and potassa solution and let it stand a few hours. Then add the alcohol and sufficient oil of bitter almonds to give it the proper flavor. Finally triturate until the mass is uniform and resembles mother of pearl. This cream has a handsome look, but is not so bland as other varieties mentioned below.

Camphor Cerate.—Olive oil, ½ lb.; white wax (pure), ¼ lb.; spermaceti, 2 oz.; camphor, ½ oz. Mix as directed under "camphor balls." Used as an application to chaps, chilblains, abrasions, excoriations, etc., also as lip salve in cold weather, as a hair cosmetic and as a mild stimulating and anodyne friction.

Camphor Paste.—Almond oil, ½ lb.; purified lard, ½ lb.; wax, spermaceti and camphor each 1 oz. Beat up the ingredients as they cool before pouring out.

Creme du Cathay (Farina).—Mecca turpentine, 3 gr.: oil of sweet almonds, 4 oz.; spermaceti, 2 drms.; flowers of zinc, 1 drm.; white wax, 2 drms.; rose water, 6 drms. Mix together over a water bath. Cosmetic for the skin.

Circassian Cream.—1. 4 oz. fresh mutton suet; 3 oz. good olive oil; 2 oz. powdered gum benzoin; ½ oz. alkanet root. Put these ingredients in a jar with a cover and place the jar in a saucepan of boiling water, at the side of the fire. Let it digest for twenty-four hours. Strain away the fluid part through fine muslin, and stir till about cold. Perfume with 2 drm. essence of roses, almonds, or any perfume desired.

2. Purified lard, 1 lb.; benzoin suet, 1 lb.; French rose pomatum, ½ lb.; almond oil colored with alkanet, 2 lb.; otto of rose, ¼ oz.

3. White wax, 166 parts; olive oil, finest, 500 parts; rose water, 100 parts; oil of bergamot, 15 parts; oil of bitter almonds, q. s. To be prepared as the preceding.

Cream, Cold (Creme Celeste).—1. Spermaceti, 30 parts; white wax, 24 parts; oil of sweet almonds, 168 parts, are melted together at a gentle heat, the melted mass poured into a warm porcelain or Wedgwood mortar, stirred until it begins to solidify and then intimately mix with rose water, 70 parts. After stirring until cold, there may be added for every 10 oz. of the mixture, oil of rose, 2 drops; oil of bitter almonds, 3 to 4 drops. This cream is white. The following formula yields a cheaper, slightly yellow, but still very good product:

Granulated Cream, Granulated Cold Cream.—Oil of almonds, ½ pt.; spermaceti (pure), 3 oz.; white wax (pure), 2½ oz.; melt by a gentle heat and add of otto of roses, 12 drops. Pour the liquid into a marble or Wedgwood ware mortar containing about 1½ pt. of lukewarm water, and agitate the whole briskly with the pestle until the oleaginous portion is well divided. Then throw the whole suddenly into a broad vessel containing 1 or 2 gal. of cold water. Next throw the "granulated cream" on a piece of muslin extended as a filter and shake and drain as much of the water out of it as possible. Lastly, put it into china or earthenware pots. It is used as ordinary cold cream.

Cold Cream with Borax.—White wax, 1 oz.; oil almonds, 4 oz.; rose water, 2 oz.; borax, ½ drm.; otto of rose, 5 drops. Dissolve the borax in the rose water and (by the aid of heat) the wax in the oil. While still warm, mix gradually in a mortar, previously warmed. Add the otto, stirring constantly.

Cosmolin Cream.—Cosmolin, 24 troy oz.; white wax, 12 troy oz.; spermaceti, 12 troy oz.; glycerine, 3 fl. oz.; oil of rose geranium, 1 fl. drm. Melt the wax and spermaceti, add the cosmolin; then stir until nearly cold; add the glycerine and oil, and stir until cold.—E. J. Davidson, in *Amer. Jour. Phar.*

Cucumber Cold Cream.—Almond oil, 1 lb.; green oil, 1 oz.; juice of cucumbers, 1 lb.; wax and sperm, each, 1 oz.; essence of cucumber, 2 oz.

Fox's Cream.—Marrow pomatum, 2 oz.; oil of almonds, 2 oz.; melt them together, by a gentle heat; add of huile au jasmin, 1 drm.; oil of bergamot, 1 drm.; and otherwise proceed as above. A popular and excellent hair [cosmetic of its class.

Glycerine Jelly.—1. The London *Chemist and Druggist* remarks: "Glycerine jelly is usually cold cream tinted with a little rose oil, and with some glycerine incorporated while it is warm. A more distinctive preparation is produced as follows: Transparent soap 1 oz., water 4 oz., glycerine 24 oz., by weight. Dissolve the soap in the water by heat, adding an equal quantity of glycerine. When dissolved, and while still hot, add the remainder of the glycerine. When nearly cold, perfume according to choice, and pour into glass jars. This is a transparent jelly of a pale amber color."

2. *Glycerine Lime Cream.*—Mix equal parts of lime water and oil of sweet almonds, add a small quantity of glycerine, and perfume to taste. If a cheaper article is required use olive oil.

3. Olive oil, 4 oz.; essence of lemons, ½ drm.; mix. Lime water, 3¾ oz.; rectified spirit of wine, ¼ oz.; mix, and then add to the oil and shake.

4. *Cream, Glycerine* (Crême de Glycerine).—Spermaceti, 60 parts; white wax, 30 parts; oil of sweet almonds, 250 parts; rose water, 10 parts; glycerine, 20 parts. To be prepared like cold cream, and to be perfumed with oil of rose and oil of bitter almonds.

5. Rose Glycerine Cream.—Spermaceti, ½ oz.; oil of sweet almonds, 2 oz.; white wax, 1 oz.; glycerine, 4 oz.; melt the spermaceti, white wax and oil of almonds together first; then add the glycerine and stir the mixture until cool. Perfume with attar of rose.

6. Glycerine Cream.—This recipe is excellent; take spermaceti, 4 drms.; white wax, 1 drm.; oil of almonds, 2 troy oz.; glycerine, 1 troy oz. Melt the spermaceti, wax, and oil together, and when cooling put in the glycerine and perfume.

Cream, Ice. See **Ice Cream.**

Lanolin Cold Creams and Cooling Ointments.—The following are a few formulæ suggested by Dr. Unna, the figures in the first columns being for ointments and in the second for creams.

Cooling.

	Parts.	
Anhydrous lanolin	10	10
Benzoated lard	20	20
Rose water	30	60

Cooling with lime water, use the same as above, but lime water instead of rose water.

Goulard's Cerate and Cream.

	Parts.	
Anhydrous lanolin	10	10
Benzoated lard	20	20
Goulard's solution	30	60

Cooling zinc ointment may be made like the rose perfumed ointment, using 20 parts of zinc ointment in place of the benzoated lard.

Cooling Pomade.

	Parts.
Anhydrous lanolin	10
Pomade	20
Distilled water	30

Any suitable perfume pomade may be used, and lime water may take the place of distilled water.

Marrow Cream.—Purified lard, 1 lb.; almond oil, 1 lb.; palm oil, 1 oz.; otto of cloves, ½ drm.; otto of bergamot, ½ oz.; otto of lemon, 1½ oz.

Mentholated Cream.—The mentholated cream frequently used by barbers as a cooling application to the face after shaving may be prepared, according to the *Pharm. Era*, as follows: Put 1 oz. tragacanth in 12 oz. of warm water, and allow to stand, with occasional agitation, for two or three days; then add 3 drm. glycerine and 40 gr. menthol dissolved in ½ oz. alcohol. Color pink with tincture of cudbear.

Oriental Cold Cream.—Oil of almonds, 6 oz.; white wax and spermaceti, of each 3 drms.; melt and add 6 oz. of rose water; 1½ oz. orange flower water. This cream will soften the skin. It should be applied with a cotton or linen cloth.

Creme de Pistache.—Melt over a water bath pistachio nuts, 4½ oz.; green oil, 1½ oz.; palm soap, 1½ oz.; wax, 1½ oz.; spermaceti, 1½ oz.; add orange flower water, 4⅞ pt.; essence of neroli, 18 oz.

Shaving Paste.—1. Naples soap, genuine, 4 oz.; card soap, air dried and powdered, 2 oz.; honey, finest, 1 oz.; essence of ambergris, or essence royale, 8 or 10 drops; oil of cassia, 8 or 10 drops; oil of nutmeg, 8 or 10 drops; beat them to a smooth paste with water or eau de rose, q. s., and put it into covered pots.

2. White wax, ¼ oz.; spermaceti, ¼ oz.; almond oil, ½ oz.; melt them together by a gentle heat, and beat in, of honey or Windsor soap, finest, ¼ lb.; the soap having been previously sliced and reduced to a paste, with rose water, q. s. When the whole has sufficiently cooled, further add of essence of musk, or essence royale, 10 or 12 drops; and otherwise proceed as before.

3. White soft soap, 4 oz.; honey soap, finest, sliced, 2 oz.; olive oil, 1 oz.; water, 1 or 2 tablespoonfuls; carbonate of soda, 1 drm.; melt them together, and form a paste, as before, adding a little proof spirit and scent, at will. Some persons melt with the soap about 1 drm. spermaceti.

In use, a very little of one of the above pastes is rubbed on the beard, with the tip of the finger, when the wetted shaving brush is applied. Produces a good lather with either hot or cold water, which dries slowly on the face.

4. Shaving Cream.—Melt 20 lb. of lard in a steam bath at a temperature of 212°, and then letting 5 lb. of caustic potash lye of 36° Baume run in very slowly during constant stirring with a wooden paddle; when the paste becomes thick, 5 lb. more of lye are added in the same manner. After several hours' stirring, the mixture becomes firm, and is finished. It is then transferred to a mortar, and triturated until the soap becomes perfectly even throughout, and assumes a pearly appearance. Attar of almonds is the perfume for almond cream, and attar of rose for rose cream. They are dissolved in a little alcohol, and added during trituration.

Snow Cream.—Spermaceti, 4½ oz.; white wax, 3 oz.; fresh oil almonds, 18 oz.; melt over a water bath; pour in a marble mortar, and stir briskly to prevent granulation. When the mixture becomes of the consistency of butter, triturate until it has a white, creamy appearance. Add gradually a mixture of double water of roses, 1½ oz.; odorless glycerine, 1½ oz.; mix for 20 minutes, then add 15 drops essence of roses; beat for about half an hour.

Vaseline Cold Cream.—Dieterich gives the following formula:

White wax	2½ oz.
Spermaceti	2½ oz.
Oil of almonds	14½ oz.
White vaseline	6½ oz.
Distilled water	6½ oz.
Borax	150 grn.
Coumarin	¾ grn.
Oil of rose	16 drops.
Oil of bergamot	16 drops.
Oil of geranium, French	5 drops.
Oil of rhodium	2 drops.
Oil of orris	1 drop.
Essence of civet (1:10)	5 drops.

Melt the wax, spermaceti, and vaseline in the almond oil, allow the melted mass to cool to a semi-liquid state, and beat it to a cream. Then add the distilled water in which the borax had previously been dissolved and finally add the perfumes, stirring constantly so as to produce a uniform cream.

Violet Cold Cream.—Huile violette, 1 lb.; violet water, 1 lb.; wax and spermaceti, each 1 oz.; otto of almonds, 5 drops.

Cream, Substitute for.—Beat 3 eggs to a stiff froth; gradually pour over them boiling hot tea, until of the thickness of cream.

Creosoting.—The injection of timber, which is exposed to atmospheric influences, with creosote in order to increase its durability. The timber is first deprived of its moisture, which is then replaced with creosote. The durability of the wood is enhanced thereby fourfold.

Creosoting Wood. See **Wood, Preservation of.**

Crême des Barbades, etc. See **Liquors.**

Creole Waters. See **Waters.**

Crickets, to Destroy.—1. Sprinkle a little quicklime near to the cracks through which they enter the room. The lime may be laid down overnight and swept away in the morning. In a few days they will most likely all be destroyed. But care must be taken that the children do not meddle with the lime, as a very small portion of it, getting into the eye, would prove exceedingly hurtful. In case of such an accident the best thing to do would be to wash the eye with vinegar and water.

2. Put a little chloride of lime and powdered tobacco in their holes.

Crocus.—The term, as employed in the mechanic arts, usually refers to a preparation of the oxide of iron used for polishing metal and gems. But the term is generic and not specific, and means, from the Greek, "saffron," a color. It is applied also to an oxide of copper and an oxide of antimony. It is coarser than rouge. Green vitriol, pulverized, is mixed with potassium nitrate and sodium chloride. The mixture is stirred up with water so that a thin paste is formed. The mixture should now be placed in an iron crucible and heated very gradually until dry. Then heat in a Hessian crucible until red hot, then pour out, cool, powder, boil with water and elutriate if necessary to purify.

Croton Oil. See **Oils.**

Croup Remedy.—Croup powder, from F. W. Gruse, in Berlin, contains 25 parts of common salt, 10 of flowers of sulphur, 25 of fœnum græcum, 25 of juniper berries, 5 of gentian root, and 5 of fennel seed.

Crucibles, Cement for. See **Cements.**

Crucibles, Black Lead.—Mix 3 parts graphite and 1½ parts fire clay with water into a paste, press in moulds and dry; but do not bake hard in a kiln. This compound makes good small furnaces.

Crystallization.—When a body in the act of passing from a liquid or gaseous to a solid state arranges itself in symmetrical forms, the process is termed crystallization and the parts of the body so aggregated are called crystals. The modes of crystallization are by fusion, sublimation, solution, and chemical reaction.

Crystal Ornament.—Ingredients: Alum, 18 oz.; water, 1 pt. Dissolve the alum in the water, boiling it in a close tinned vessel over a moderate fire, keeping it stirred with a wooden spatula until the solution is completed. When the liquor is almost cold, suspend a small basket, ears of corn, moss rose, hyacinth, or almost any vegetable specimen, by means of a small thread or twine from a lath or small stick placed horizontally across the aperture of a deep glass or earthenware jar, into which the solution is poured. The respective articles should remain in the solution twenty-four hours; when they are taken out, they are to be carefully suspended in the shade until quite dry. The whole process of crystallization is best conducted in a cool situation. When the objects to be crystallized are put into the solution while quite cold, the crystals are apt to be formed too large; on the other hand, should it be too hot, the crystals will be small in proportion. The best temperature is about 95° Fah.

Crystal Room Ornament, to Make.—Ingredients: Sulphate of alumina, sulphate of copper, sulphate of soda, sulphate of potass., sulphate of iron, sulphate of zinc, sulphate of magnesia, of each ½ oz., in separate chip boxes. Directions: Dissolve each of the salts in warm water in a separate tumbler. When dissolved, pour all together into an evaporating dish, and mix well with a glass rod. Place the dish in a warm place where it cannot be affected by dust, and where it is not liable to be agitated. When evaporation has taken place, the whole will begin to shoot out into crystals. Their color and peculiar form of crystallization will distinguish each crystal separately, and the whole together will display a very curious and pleasing appearance. Preserve carefully from dust.

Cupellation.—Gold and silver are assayed in shallow, conical crucibles, called cupels. The oxides of the ore are absorbed by the cupel, while the button of precious metal remains.

Curaçao. See **Liquors.**

Curling. See **Brass Coloring and Finishing.**

Curling Fluid. See **The Hair.**

Currant Wine. See **Wines.**

Curry Powder. See **Powders.**

Curry Vinegar. See **Vinegar.**

Curtains, to Wash. See **Cleansing.**

Curvature of the Earth.—The amount of curvature in one mile of ocean surface is 2·04 inches.

Cutlery, Etching for. See **Etching.**

Cutlery, to Harden. See **Hardening.**

Daguerreotype. See **Photography.**

Damaskeening. The figuration presented by the surface of steel and iron guns, small arms, etc., and also the plain brown or black surface of modern steel guns, is known as "damaskeening," and is produced by treatment with weak acids, which act unequally upon the different parts of the metal under treatment, the harder portions of the metal becoming covered with a thicker film of carbon than the softer portions. The color of these thin films varies from light brown to black, according to the more or less prolonged treatment with the acids. If the figuration is not sufficiently elaborate, owing to the metal not having sufficient fiber, and to the fiber being too straight and regular to produce the desired effect, it is customary for the makers of fowling pieces and other light goods to paint or stencil a pattern on the surface of the metal with the acid, and in this way the figuration can be made as effective as desired. The solutions largely used at many works are as follows:

1. For steel, sulphur, 1 oz.; tincture of steel, 1 oz.; nitric acid, 1 oz.; sulphuric acid, ¼ oz.; mercuric chloride, ½ oz.; copper sulphate, ½ oz.; spirit of nitrous ether, 1 oz.; water, 1 qt.

2. For iron, tincture of iron, ½ oz.; nitric acid, 1¼ drm.; mercuric chloride, 1 drm.; copper sulphate, ½ drm.; spirits of wine, 6 drm.; water, 8 oz.

3. The solution used at Woolwich and Elswick for steel guns, etc.: Tincture of iron, 2 oz.; nitric acid, 1 oz.; copper sulphate, 1 oz.; spirit of nitrous ether, 1½ oz.; spirits of wine, 1½ oz.; water, 1 gal. This is a much better solution, works remarkably well; it is smeared over the parts, and when dry another coat is put on. This will produce a brown color; but if it is not dark enough, the operation must be repeated until the desired tint is obtained. Six coats are sufficient to make the surface black. The acid is then killed by washing with soda solution, and the surface rubbed with a hard brush or file card until smooth, after which it is rubbed with oily waste. For iron there is nothing better than mercuric chloride or antimony chloride, dissolved in water, with a little spirit of wine added to help it to dry.

Dammar, or Damar.—A resin employed in mounting many microscopic objects, as teeth, hair, hard bone, and most tissues which have been previously hardened by treatment with alcohol and chromic acid. Dammar is prepared for use as follows:

1. Gum dammar, ½ oz.; oil turpentine, 1 oz.; dissolve and filter.

2. Gum mastic, ½ oz.; chloroform, 2 oz.; dissolve and filter. Add solution 1 to solution 2. If allowed to become thick by drying, dammar may be used as luting.—*Dr. Klein.*

Dammar Varnish. See **Varnishes.**

Damson Wine. See **Wines.**

Dandruff. See **The Hair.**

Dead, the Preservation of. See also **Embalming.**—(Brunetti.) 1. Wash the circulatory system with cold water. Alcohol is injected to abstract the water. Ether is then introduced to remove the fatty matters. A strong solution is now injected, and the body is dried by means of warm air which has been passed over heated calcium chloride.

2. A simple form of injection suitable for anatomical specimens consists of glycerine, 14 parts; soft sugar, 2 parts; potassium nitrate, 1 part. This has been found to be very efficient, as the parts saturated with it become comparatively indestructible, and change neither in size nor figure.

Decantation.—The operation of pouring or drawing off the clear portion of a liquid from the impurities or grosser matter that has subsided. It is much resorted to in the laboratory and is very simple, as the operation may be performed by drawing off the water with a siphon, or by simply pouring it off. See **Elutriation.**

Decoctions, to Prepare.—For making decoctions the substances, if dry, should be well bruised, or reduced to a very coare powder, or, if fresh and soft, they should be sliced small. In the former case, any very fine powder or adhering dust should be removed with a sieve, as its presence would tend to make the product thick and disagreeable, and also more troublesome to strain. The vessel in which the boiling is conducted should be closely covered, the better to exclude the air; and the heat should be so regulated that the fluid may be kept simmering, or only gently boiling; as violent boiling is both unnecessary and injurious. In every case the liquor should be strained while hot, but not boiling; and the best method of doing this is to employ a fine hair sieve or a coarse flannel bag. In preparing compound decoctions, those ingredients should be boiled first which impart their active principles least readily, and those which most readily impart them should be added afterward. In many cases it will be proper simply to infuse the

more aromatic substances in the hot decoctions of the other ingredients, by which means their volatile principles will be preserved. When the active principles of the principal ingredients are volatile, infusion should be had recourse to, instead of boiling. *Strength of.*—Decoctions of substances not exerting a very powerful influence on the system may be made, as a general rule, by boiling an ounce, if dry, or a handful, if green, in a pint of water for ten or fifteen minutes. *Dose of.*—The ordinary dose of decoctions thus prepared is a half to a wineglassful three or four times daily, or more frequently.

Decoloration.—The blanching or loss of the natural color of any substance. Sirups, and many animal, vegetable and saline solutions are decolored or whitened by agitation with animal charcoal, and subsequent subsidence or filtration. Many fluids rapidly lose their natural color by exposure to light, especially the direct rays of the sun. In this way, castor, nut, poppy, and several other oils are whitened. By the joint action of light, air, and moisture, cottons and linens are commonly bleached. The peculiar way in which light produces this effect has never been satisfactorily explained. That it is not dependent on the absorption of oxygen, appears evident from the fact that contact with air is not always necessary, I find that raw castor oil, exposed to the sun in a bottle closely corked, will whiten with as much rapidity as that in another similar sized bottle, placed beside it and left uncorked. There is, however, a small quantity of gaseous matter given off, which has an odor resembling carbureted hydrogen; but in the open bottle, oxygen is continually absorbed, certain oily acids formed, and some impure carbonic acid evolved. When this action is permitted to go on for some time, the oil becomes thick and rancid, but may be partially restored to its former state, by filtration through coarsely powdered and freshly burnt animal charcoal. The latter substance is commonly employed to deprive fish oils of their disagreeable odor, as well as to lessen their color. The decoloration of textile fabrics and solid bodies generally is called bleaching.—*Cooley.*

Decrepitation.—In the vaporization of the water of crystallization the substance frequently makes a crackling noise and portions of the substance fly up and are lost; this never ought to occur in making an analysis.

Defecation.—The separation of a liquid from its lees, dregs, or impurities by subsidence and decantation. It is commonly employed for the purification of saline solutions, and glutinous or unctuous liquids on the large scale, in preference to filtration.

Deflagration.—A kind of roasting effected by rapidly heating the substance with some additional body as an oxidizing agent, as a chlorate or nitrate. The heat should be applied gradually.

Deliquescence.—The absorption of the moisture of the atmosphere by substances and their solution therein. The term is applied to certain salts that by exposure gradually assume the liquid state. Such salts are said to be deliquescent.

Delta Metal. See **Alloys.**

Dentifrices. See **The Teeth.**

Depilatories. See **The Hair.**

Depreciation of Machinery, etc., per Annum on First Cost.

	Depreciation.	Wear and Tear.	Total.
Engines	3%	3 %	6 %
Boilers	7%	3 %	10 %
Machines	5%	3 %	8 %
Millwork and gearing	3%	2½%	5½%
Bands and belts		45 %	45 %

Desilvering. See **Silvering.**

Desiccation.—The drying of substances by driving off or evaporating their watery portion by means of natural or artificial heat, currents of air, or exposing them to air rendered artificially dry.

Developer. See **Photography.**

Dewrance's Metal. See **Alloys.**—*White Metal.*

Dextrine.—British or starch gum. A soluble substance resembling gum, formed by the action of dilute acids at the boiling temperature, and by infusion of malt at about 160° F. on starch. It is also formed when potato starch is heated to 400° Fah. Used extensively in the manufacture of mucilages, etc. It resembles gum. Its name is derived from the action of its solution on polarized light; it causes the plane of polarization to deviate to the right.

Commercial dextrine, or "British gum," is obtained by heating dry potato starch to a temperature of 750° Fah. in sheet iron trays or revolving iron or copper drums, similar to those used in coffee roasting, whereby it is transformed into semi-transparent, brownish lumps, which are converted into a pale yellow powder by grinding between millstones. It is completely soluble in cold water, from which it may be precipitated by addition of excess of strong alcohol. Potato starch is generally used, but starch from other sources will answer. The best tests to ascertain its purity are to agitate briskly a few grains of the dextrine in a test tube with fifty times its weight of pure cold water; then set it aside for 10 minutes. Pure dextrine dissolves completely in cold water to a clear solution. If not all dissolved pour off the solution, add a little water to the residue, heat to boiling, let cool, and add a few drops of iodine water; a blue color indicates starch.

Dextrin Paste. See **Pastes.**

Diagrams for Lantern Use.—Take thin transparent sheet zylonite or celluloid and wash thoroughly with water. When dry rub with fine whiting, to remove all grease. Drawings or writing can now be placed on the zylonite as easily as on paper. Tracings can be readily made which are better than those on gelatine. Clamp the finished work between two glasses 3¼ by 4 in., and bind the edge with paper.

Dialysis.—Dialysis means effecting analysis by diffusion through porous septa. The apparatus consists of a wooden or gutta percha hoop, having a parchment bottom. It is used for the separation of all crystallizable bodies from all gelatinous bodies, etc. The substance to be analyzed is placed in the dialyzer, and floated on pure distilled water. It must be allowed to stand thus for at least twenty-four hours, when at the end of that time the crystalline substances will have passed or diffused through the parchment and dissolved in the water, leaving the gelatinous matter still in the dialyzer.

Diamantkitt. See **Cements.**

Diamonds, to Test.—Put the stone in a leaden cup with some powdered fluorspar and a little oil of vitriol. Warm the vessel over a fire where there is a copious draught to carry off the noxious vapors that will be evolved. When these vapors have ceased, stir the mixture with a glass rod to fish out the diamond. A genuine stone will remain intact, but a fictitious one will be corroded by the hydrofluoric acid that has been generated around it. Dangerous. Perform only in the open air, if at all. [Not recommended.—ED.]

Diaphoretics.—The medicines which are used in illnesses where there is fever and great dryness of the skin, to create perspiration.

Boneset Tea (to Cause Perspiration).—1½ oz. boneset is stood in 1½ pt. boiling water for half an hour, and a wineglassful is administered to the patient as hot as he can take it, every half hour.

Diarrhœa Mixture.—*Loomis' Diarrhœa Mixture.*—Tincture of opium, ½ fluid oz.; tincture of rhubarb, ½ fluid oz.; compound tincture of catechu (U. S. P.), 1 fluid oz.; oil of sassafras, 20 minims; compound tincture of lavender, enough to make 4 fluid oz.

Squibb's Diarrhœa Mixture.—Tincture of opium, 1 fluid oz.; tincture of capsicum, 1 fluid oz.; spirit of camphor, 1 fluid oz.; purified chloroform, 180 minims; alcohol, enough to make 5 fluid oz.

Thielemann's Diarrhœa Mixture.—Wine of opium, 1 fluid oz.; tincture of valerian, 1½ fluid oz.; ether, ½ fluid oz.; oil of peppermint, 60 minims; fluid extract of ipecac, 15 minims; alcohol, enough to make 4 fluid oz. This preparation is practically identical with the "Mixtura Thielemanni" of the Swedish Pharm.

Velpeau's Diarrhœa Mixture.—Tincture of opium, compound tincture of catechu (U. S. P.), spirit of camphor, each equal volumes.

Diastase.—A peculiar substance, contained in malt, which effects the conversion of starch into dextrine and grape sugar. It may be procured from a cold infusion of malt, by adding alcohol, which precipitates it under the form of a tasteless white powder. In this state it is freely soluble in water. It appears from experiments that 1 part of diastase will convert 2,000 parts of starch into grape sugar. Malted barley is said to contain $\frac{1}{300}$ part of this substance; yet this small portion is quite sufficient to convert the starch of the malt into sugar during the operation of mashing, provided this be properly conducted. The most favorable temperature for this conversion is 140° to 149° Fah.

Digestion.—Is the term used to denote the action of liquids upon substances from which it is desired to extract the active principles, when allowed to remain upon them for some time at a temperature of from 90° to 100°. It is sometimes performed at a higher temperature, but must always be kept below that at which the liquid boils. To secure the uniform temperature required, the bath is usually employed.

Digestive Pastilles.—Bismuth subnitrate 20 parts, calcium phosphate 30 parts, sodium bicarbonate 10 parts, magnesium carbonate 200 parts, iron carbonate 50 parts, sugar 1,000 parts. Flavor with peppermint; make in pastilles; three to twelve may be taken daily.

Digestive Pastilles of Borivent.—Bismuth subnitrate 20 parts, calcium phosphate 30 parts, sodium bicarbonate 10 parts, magnesium carbonate 200 parts, iron carbonate 50 parts, sugar 1,000 parts. Flavor with essence of peppermint, anise, or orange flowers. Make into pastilles of 1 grm. each, of which 3 to 12 may be taken daily.

Diluents.—Aqueous liquors which increase the fluid part of the body; tea, barley water, gruels, etc., are the best known.

Dip, Carbolic, for Stock.—Receipt for making a carbolic dip into which stock may be plunged for killing lice and mites. Use soft soap 1 gal., heat with 30 gal. of water up to a temperature of 140°, then add 1 qt. of crude carbolic acid; then cool down to 110° and dip the sheep or lambs; but for other animals, pour it along the back, so that it runs down the sides. Great care must be taken that it is applied to the brisket, under the shoulders and thighs. For the sheep scab mites the temperature should be 120°, and the scabs should be completely broken up by a corn cob.

Dips for Brass. See **Brass, Coloring of.**

Disinfectants and How to Use Them.—The National Board of Health, consisting of a number of our leading physicians and chemical experts, of which Prof. C. F. Chandler is chairman, have issued the following instructions for disinfection, intended especially for yellow fever districts, but which are equally applicable in other classes of contagious diseases.

No reliance can be placed on disinfectants simply because they smell of chlorine or carbolic acid, or possess the color of permanganate, and that, in general, proprietary disinfectants with high-sounding names are practically worthless, as they either have no value whatever or, if of value, cost many times as much as they are worth, and cannot be used in sufficient quantity.

Explanations.—Disinfection is the destruction of the poisons of infectious and contagious diseases. Deodorizers, or substances which destroy smells, are not necessarily disinfectants, and disinfectants do not necessarily have an odor. Disinfection cannot compensate for want of cleanliness or of ventilation.

I. Disinfectants to be employed.—1. Roll sulphur, brimstone, for fumigation.

2. Sulphate of iron, copperas, dissolved in water in the proportion of 1½ lb. to the gal.; for soil, sewers, etc.

3. Sulphate of zinc and common salt, dissolved together in water in the proportions of 4 oz. sulphate and 2 oz. salt to the gal.; for clothing, bed linen, etc.

Note.—Carbolic acid is not included in the above list for the following reasons: It is very difficult to determine the quality of the commercial article, and the purchaser can never be certain of securing it of proper strength; it is expensive, when of good quality, and experience has shown that it must be employed in comparatively large quantities to be of any use; it is liable by its strong odor to give a false sense of security.

II. How to Use Disinfectants.—1. In the Sick Room.—The most available agents are fresh air and cleanliness. The clothing, towels, bed linen, etc., should at once, on removal from the patient, be placed in a pail or tub of the zinc solution, boiling hot if possible, before removal from the room. All discharges should either be received in vessels containing copperas solution, or, when this is impracticable, should be immediately covered with copperas solution. All vessels used about the patient should be cleansed with the same solution. Unnecessary furniture—especially that which is stuffed—carpets, and hangings, when possible, should be removed from the room at the outset; otherwise, they should remain for subsequent fumigation and treatment.

2. Fumigation with sulphur is the only practicable method for disinfecting the house. For this purpose the rooms to be disinfected must be vacated. Heavy clothing, blankets, bedding, and other articles which cannot be treated with zinc solution, should be opened and exposed during fumigation, as directed below. Close the rooms as tightly as possible, place the sulphur in iron pans supported upon bricks, set it on fire by hot coals, or with the aid of a spoonful of alcohol, and allow the room to remain closed for twenty-four hours. For a room about ten feet square, at least two pounds of sulphur should be used; for larger rooms, proportionally increased quantities.

3. Premises, cellars, yards, stables, gutters, privies, cesspools, water closets, drains, sewers, etc., should be frequently and liberally treated with copperas solution. The copperas solution is easily prepared by hanging a basket containing about sixty pounds of copperas in a barrel of water.

4. Body and Bed Clothing, etc.—It is *best* to burn all articles which have been in contact with persons sick with contagious or infectious diseases. Articles too valuable to be destroyed should be treated as follows: *a.* Cotton, linen, flannels, blankets, etc., should be treated with the boiling hot zinc solution, introducing piece by piece, securing thorough wetting, and boiling for at least half an hour.

b. Heavy woolen clothing, silks, furs, stuffed bed covers, beds, and other articles which cannot be treated with the zinc solution, should be hung in the room during fumigation, pockets being turned inside out, and the whole garment thoroughly exposed. Afterward they should be hung in the open air, beaten, and shaken. Pillows, beds, stuffed mattresses, upholstered furniture, etc., should be cut open, the contents spread out and thoroughly fumigated. Carpets are best fumigated on the floor, but should afterward be removed to the open air and thoroughly beaten.

5. The corpses should be thoroughly washed with a zinc solution of double strength, then wrapped in a sheet wet with the zinc solution, and buried at once. Metallic, metal-lined, or air-tight coffins should be used when possible, certainly when the body is to be transported for any considerable distance.

Eckstein finds that bleaching powder is the most effective disinfectant for privies, urinals, etc., inasmuch as it rapidly decomposes hydrogen compounds, such as ammonia, sulphureted hydrogen, etc. It is conveniently applied in a bag made of parchment paper, through which the disinfectant slowly passes by osmosis. Comparative experiments made in the author's house (where at least one hundred persons use the closets daily) gave the following results:

1. 2 lb. sulphate of iron (green vitriol) dissolved in water prevented the production of smell for two or three hours, and had wholly lost its preservative action in twelve hours.

2. Sulphate of copper in solution produced the same result.

3. 2 lb. solid sulphate of iron or sulphate of copper acted as a disinfectant for two full days.

4. A mixture of iron and copper sulphates and carbolate of lime (2 lb. in all) only remained active for two days.

5. Solution of sulphurous acid lost its action quickly; it was perceptible to the respiratory organs for an hour.

6. Crude carbolic acid filled the house with a peculiar tarry odor for two days. This was so powerful that it could not be determined whether the smell of the fæcal matter was decomposed or merely hidden by a more powerful odor.

7. 2 lb. sulphate of iron in a parchment paper bag only became active after two hours, and remained active for full three days, at the end of which time the bag contained a muddy liquor destitute of smell.

8. 2 lb. good commercial bleaching powder in a parchment bag became active in two hours, and remained efficacious for full nine days, without in the least affecting respiration or smell.

9. Crude permanganate of soda disinfected immediately, but only lasted for one day. In a parchment paper bag the same quantity lasted two days.

10. As regards remedies which prevent the further development of spores, the following results were obtained. The first number means retarding the development, the rest totally preventing it:

Corrosive sublimate	1 : 1,600,000	1 : 320,000
Oil of mustard	1 : 330,000	1 : 33,000
Arsenite of potash	1 : 100,000	1 : 10,000
Thymol	1 : 80,000	
Oil of turpentine	1 : 75,000	
Hydrocyanic acid	1 : 40,000	1 : 8,000
Oil of peppermint	1 : 33,000	
Chromic acid	1 : 10,000	1 : 5,000
Picric acid	1 : 10,000	1 : 5,000
Iodine	1 : 5,000	
Salicylic acid	1 : 3,300	1 : 1,500
Permang. of potash	1 : 3,000	
Muriatic acid	1 : 2,500	1 : 1,700
Camphor	1 : 2,500	
Eucalyptol	1 : 2,500	
Benzoic acid	1 : 2,000	
Borax	1 : 2,000	1 : 700
Carbolic acid	1 : 1,250	1 : 300

Recent researches have demonstrated that many of the agents which have been found useful as deodorizers, or as antiseptics, are entirely without value for the destruction of disease germs.

Antiseptic agents, however, exercise a restraining influence upon the development of disease germs, and their use during epidemics is to be recommended when masses of organic material in the vicinity of human habitations cannot be completely destroyed, or removed, or disinfected.

A large number of the proprietary "disinfectants," so called, which are in the market, are simply deodorizers or antiseptics of greater or less value, and are entirely untrustworthy for disinfecting purposes.

Displacement. See **Percolation.**

Distillation is the vaporizing a liquid in one vessel, and conducting it in this condition to another, where it is condensed and collected. It may be used for separating liquids from solid substances with which they are mixed, for separating more volatile liquids, as ether or alcohol, with which they are mixed, from others less so, and for impregnating liquids with the volatile principles of plants, etc., as in the preparation of the aromatic spirits, cologne water, etc. It may be performed in a small way with a glass retort and receiver, the heat applied by a spirit lamp, and the condensation effected by placing the retort in a vessel of cold water, or surrounding it with a cloth wet with cold water.

Diuretics.—Those medicines promoting the secretion of urine; the principal diuretics being those which act by increasing the watery portion of the blood.

Buchu Leaves.—1 oz. of leaves are infused in 1 pt. of boiling water for three or four hours. Dose: A wineglassful three times a day.

Dolls' Heads, Composition for.—Take 50 parts pulverized clay slate and mix it with a paste already compounded of 20 parts paper pulp and 30 parts plaster of Paris and water q. s. This is then ready for casts.

Dominical Letter, to Find.—Rule: Divide the number of centuries and the years of the given century each by 4, and the years again by 7; multiply the remainders respectively by 2, 2, and 4; add together the three products, and increase their sum by 1: then divide the whole sum by 7, and the remainder will be the ordinal number of the dominical letter required. If 0 remain, it will be the 7th, or G. In bissextile years two dominical letters are used. Example: 1884.

$\frac{18}{4}$ = 4 and 2 rem. $2 \times 2 = 4$
$\frac{84}{4}$ = 21 and 0 rem. $0 \times 2 = 0$
$\frac{84}{7}$ = 12 and 0 rem. $0 \times 4 = 0$

4
Add 1
5

which, being less than 7, is the ordinal number for E; it being a bissextile year, F precedes E until the 1st of March, the order of the letters being reversed as applied to the succeeding years.

Door Plates, Composition for. See **Compositions.**

Doors, to Prevent the Creaking of.—Rub a little soap on the hinges; or, make a mixture of equal parts of lard, black lead, and soap, and apply.

Dragon's Blood. (Sanguis Draconis.)—A rich, red colored resin, obtained from various species of the genus Calamus. Its color in the lump is a dark, brownish red; in powder bright red. It is friable, breaks with a shining fracture, and has a sp. gr. not higher than 1·196 or 1·197. When pure, it readily dissolves in alcohol, ether, and oils, yielding rich red transparent solutions. Adulterated and factitious dragon's

blood is only partly soluble, and lacks the rich color of the genuine article. Dragon's blood is chiefly used to tinge varnishes and lacquers.

Factitious Dragon's Blood.—Red sanders, 7 parts; yellow resin, 9 parts; castor oil, 2 parts; benzoic acid, 3 parts; oxalate of lime, 1 part; phosphate of lime, 2 parts. Mix, with heat.

Drawing Crayons. See **Crayons.**

Drawings, to Color.—For coloring drawings the most soluble, brilliant, and transparent water colors are used; this particularly applies to plans and sections. The color is not so much intended to represent that of the material to be used in the construction as to clearly distinguish one material from another employed on the same work. The following table shows the colors most employed by the profession:

Carmine of crimson lake	For brickwork in plan or section to be executed.
Prussian blue	Flintwork, lead, or parts of brickwork to be removed by alterations.
Venetian red	Brickwork in elevation.
Violet carmine	Granite.
Raw sienna	English timber (not oak).
Burnt sienna	Oak, teak.
Indian yellow	Fir timber.
Indian red	Mahogany.
Sepia	Concrete works, stone.
Burnt umber	Clay, earth.
Payne's gray	Cast iron, rough wrought iron.
Dark cadmium	Gun metal.
Gamboge	Brass.
Indigo	Wrought iron (bright).
Indigo, with a little lake	Steel (bright).
Hooker's green	Meadow land
Cobalt blue	Sky effects.

And some few others occasionally for special purposes.—*Mechanic's Own Book.*

Drawings, to Fix.—1. Immerse the drawing in skimmed milk. A special fixative is sold for the purpose by dealers in art materials. Collodion, if very thin, might be used with advantage; often used for manuscripts.

2. Flow with very thin collodion.

3. 2 tablespoonfuls of rice boiled in 1 pt. or 1½ pt. of water; strain, and pass the drawing quickly through the liquid; use a large flat dish for the liquid.

4. Prepare water starch, in the manner of the laundress, of such a strength as to form a jelly when cold, and then apply with a broad camel hair brush, as in varnishing. The same may be done with thin cold isinglass water or size, or rice water.

Drawing on Glass.—To write or draw on glass, it is necessary to impart to the surface a certain degree of roughness. This may be done by grinding or etching, but much more easily by applying some appropriate varnish. A good matt varnish is made by dissolving in 2 oz. of ether, 90 grms. of sandarac and 20 grms. mastic, and adding benzol, ½ oz. to 1½ oz., according to the fineness of the matt required. The varnish is applied to the cold plate after it has set. The glass may be heated to insure a firm and even grain. To render the glass again transparent, after writing upon it, apply with a brush a solution of sugar or gum acacia.

Still better as a surface for writing or drawing is a varnish of sugar. Dissolve equal parts of white and brown sugar in water to a thin sirup, add alcohol, and apply to hot glass plates. The film dries very rapidly, and furnishes a surface on which it is perfectly easy to write with pen or pencil. The best ink to use is India ink, with sugar added. The drawing can be made permanent by varnishing with a lac or mastic varnish.

Drawing Ink. See **Inks.**

Drawing Instruments, to Clean. See **Cleansing.**

Drawings, Lacquer for. See **Lacquers.**

Drawings or Paper, Mounting on Linen.—The linen or calico is first stretched by tacking it tightly on a frame or stretcher. It is then thoroughly coated with strong size, and left until nearly dry. The sheet of paper to be mounted requires to be well covered with paste; this will be best if done twice, leaving the first coat about ten minutes to soak into the paper. After applying the second coat, place the paper on the linen and dab it all over with a clean cloth. Cut off when thoroughly dry.

Drawings, to Mount and Varnish.—Paste the drawing on the background. Flour paste is as good as any; and when it is dry, size the surface with a solution of gum arabic or white glue. When that is dry, use any varnish you please. For a delicate picture or drawing, dammar varnish is the best; but it must be applied rapidly to secure an even surface.

Drawing Paper. See **Paper.**

Drawing Paper, to Prevent Oil Spreading on.—Dissolve ¼ oz. clear gelatine in 6 oz. hot water, strain and apply to paper. Let it get dry before painting.

Drawing Paper, to Fix on Drawing Boards.—Take a sheet of drawing paper and damp it on the back side with a wet sponge and clean water. While the paper is expanding, take a spoonful of wheat flour, mix with a little cold water, and make it a moderately thick paste; spread the paste round the edge of the drawing paper 1 in. wide with a feather, then turn the drawing paper over and press the edges down on the board. After this take four straight pieces of deal wood, ¾ in. by 2¼ in. wide; place them on the edge of the drawing paper, and put a large book or heavy weight on each corner to make the paper adhere firmly to the board. In about an hour's time the paper will be straight and even, and quite ready for executing a drawing. When the drawing is finished, take a sharp knife and raise one corner of the paper, then take a scale, run it round the edges, and the paper will come off easily. Turn it over and take the dry paste off with a knife, and all will be perfectly clean, and no paper will be wasted.

Dimensions of Drawings for Patents, United States.—All of drawing and signature to be within marginal line of 8x13 in. Leave 1 in. margin, making the paper 10x15 in.

Drawings, to Trace.—If the paper upon which the tracing is to be made is soaked with benzine by means of a cotton pad, sopping it into the pores of the paper, the latter will become so transparent that the most delicate lines and tints may be seen more readily than through the finest tracing paper. Indian ink, water colors, or pencil take equally well upon paper thus treated, and last better than upon any other kind of tracing paper. Any kind of opaque drawing paper in ordinary use may be employed for this purpose, stretched in the usual manner over the drawing to be traced. The benzine rapidly evaporates, and the paper resumes its original opaque appearance without showing the slightest trace of the process to which it has been subjected. When large pictures are to be traced, the benzine should only be applied to a part of the paper at a time, in accordance with the progress of the work.

Drawings, Varnish for. See **Varnishes.**

Driers.—1. For a liquid drier, boil 1 qt. linseed oil for an hour with a pound of finely powdered binoxide of manganese. For a solid drier use borate of manganese in powder, or mixed with oil.

2. Cobalt and Manganese Benzoates.—Benzoic acid is dissolved in boiling water, the liquid be-

ing continually stirred, and neutralized with cobalt carbonate until effervescence ceases. Excess of carbonate is removed by filtration, and the liquor is evaporated to dryness. The salt thus prepared is an amorphous, hard, brownish material, which may be powdered like rosin, and kept in the pulverulent state in any climate, simply folded in paper. Painting executed with a paint composed of 3 parts of this drier, with 1,000 of oil and 1,200 of zinc white, dries in 18 to 20 hours. Manganese benzoate is prepared in the same way, substituting manganese carbonate for that of cobalt. Applied under similar circumstances, it dries a little more rapidly, and a little less is required. Urobenzoic (hippuric) acid is equally efficacious.

3. Cobalt and Manganese Borates.—These salts also, in the same proportions, are found to be of equal efficacy. The latter is extremely active, and requires to be used in much smaller proportions.

4. Resinates.—If an alkaline resinate of potash or soda be dissolved in hot water, and this solution be precipitated by a solution of a proportionate quantity of cobalt or manganese chloride or sulphate, an amorphous resinate is formed, which, after being collected on cloth filters, washed, and dried, forms an excellent drier.

5. Zumatic (Transparent) Drier.—Take zinc carbonate, 90 lb.; manganese borate, 10 lb.; linseed oil, 90 lb. Grind thoroughly, and keep in bladders or tin tubes. The latter are preferable.

6. Zumatic (Opaque) Drier.—Manganese borate, as a drier, is so energetic that it is proper to reduce its action in the following way: Take zinc white, 25 lb.; manganese borate, 1 lb. Mix thoroughly, first by hand, then in a revolving drum; 1 lb. of this mixed with 20 lb. paint insures rapid drying.

7. Manganese Oxide.—Purified linseed oil is boiled for 6 or 8 hours, and to every 100 lb. boiled oil are added 5 lb. powdered manganese peroxide, which may be kept suspended in a bag, like litharge. The liquid is boiled and stirred for 5 or 6 hours more, and then cooled and filtered. This drying oil is employed in the proportion of 5 to 10 per cent. of the zinc white.

8. Guynemer's.—Take pure manganese sulphate, 1 part; manganese acetate, 1 part; calcined zinc sulphate, 1 part; white zinc oxide, 97 parts. Grind the sulphates and acetate to impalpable powder, sift through a metallic sieve. Dust 3 parts of this powder over 97 parts of zinc oxide, spread out over slab or board, thoroughly mix, and grind. The resulting white powder, mixed in the proportion of ½ or 1 per cent. with zinc white, will enormously increase the drying property of this body, which will become dry in ten or twelve hours.

In using driers, observe that you (1) do not employ them needlessly with pigments which dry well in oil color, (2) nor in excess, which would retard the drying, (3) nor add them to the color until about to be used, (4) nor use more than one drier to the same color, (5) nor use any at all in the finishing coat of light colors.—*Mechanics' Own Book.*

9. A good drier for paints is made by grinding or dissolving a small quantity of sugar of lead in linseed oil.

10. Drier for Oil Colors and Varnishes.—Water 100 parts; gum lac, 12 parts; borax, 4 parts.

11. Driers (Painters').—Litharge (best) ground to a paste, with drying oil. For dark colors.

12. White copperas and drying oil; as the last.

13. Sugar of lead and drying oil. The last two are for pale colors.

14. White copperas and sugar of lead, of each 1 lb.; pure white lead, 2 lb. For "whites," and opaque light colors, grays, etc. Driers are employed, as the name implies, to increase the drying and hardening properties of oil paints. A little is beat up with them at the time of mixing them with the oil and turpentine for use.

Drills, to Harden. See **Hardening.**

Drills, to Temper. See **Tempering.**

Dross.—The sullage, scurf, oxide, and other impurities which are skimmed off the top of molten metals, or which accumulates in the head or in the riser.

Drowned.—*Rules for Artificial Respiration in the Treatment of the Drowned.*—Rule 1. (Fig. 1.)—To Drain and Force Water from the Lungs and Stomach.—Instantly place patient face downward, a hard roll of clothing being placed beneath the pit of the stomach, to raise it as much as possible above the level of the mouth. Put one wrist of the patient under his forehead to raise his mouth off the ground. With hands

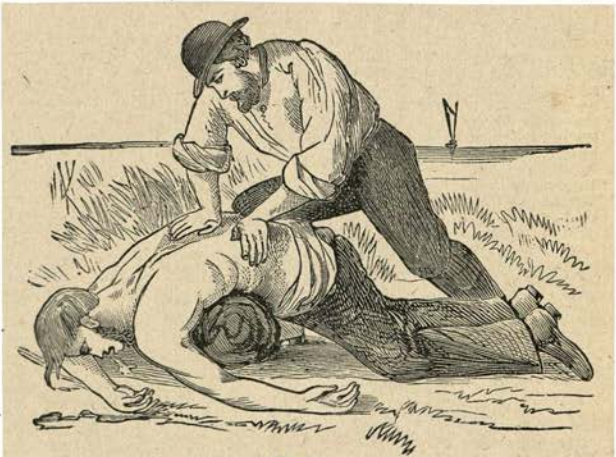


Fig. 1.

Fig. 2.

well spread upon the patient's back, above the roll of clothing, throw upon it your whole weight with a forward motion, and keep up the pressure about three seconds, so as to force all water from the stomach and lungs out of the mouth, ending the pressure with a push which will help to jerk you back to your upright position. Repeat this once or twice, and then quickly proceed with—

Rule II. (Fig. 2.)—To make the patient breathe.—Turn the patient face upward, the same hard roll of clothing being now beneath his back, the shoulders slightly drooping over it. Bend the head backward and downward, putting the throat on the stretch to the utmost. Place the hands of the patient on the top of his head; one twist of a handkerchief or string around the crossed wrists will keep them there. Rip or strip all clothing from waist and neck. Now kneel astride the patient's hips. Grasp the front part of the chest on both sides of the pit of the stomach, your thumbs pointing to patient's chin, and your fingers fitting into the grooves between the short ribs. Fix your elbows firmly, making them one with your sides and hips, and then, firmly pressing the sides of the patient together, and using your knees as a pivot, throw yourself slowly forward two or three seconds until your face almost touches the face of the patient, and your whole weight presses upon his chest. End this pressure with a short push which suddenly jerks you back again to the upright kneeling position.

Rest three seconds while the ribs spring back; then repeat this bellows-blowing movement as before, gradually increasing the rate from seven to ten times a minute; but take the utmost care, on the occurrence of a natural gasp, not to interrupt it; but, as the ribs fall, gently press them and deepen the gasp into a longer breath. Continue this until the natural breathing, which you are imitating, needs no further assistance. If all fails, keep on, because any moment within an hour's effort you may be unexpectedly rewarded with success.

Avoid impatient vertical pushes; the force must be upward and inward, increased gradually from zero to the maximum the age, sex, etc., may indicate.

If a second person be present and can do it, the tongue should be held out of one corner of the mouth by the thumb and finger, armed with a piece of dry cotton or linen rag. (Fig. 2, *a*.)

We take our illustrations from the London *Lancet*.

Druggists' Show Bottles. See **Show Bottles.**

Druxey.—Timber in a state of decay, with white, spongy veins.

Dubbing.—Resin, 10 lb.; tallow, 5 lb.; train oil, 5 gal.

Ductility.—That property of metals in virtue of which they can be drawn out into wires. This property depends partly on malleability, but chiefly upon the tenacity of the particles composing the metal.

Dusting Powders. See **Powders.**

Dyes for the Hair. See **The Hair.**

Dyeing.—Dyeing receipts in receipt books are frequently unreliable, either on account of being obtained from some other source than the practical dye, or in consequence of being antiquated. Failures will inevitably result if the minute details of the art are not well understood. The dyeing receipts here given are mainly selected from the writings of Crookes, Gardner, and Reimann, and are probably the most reliable that can be obtained; the more complex formulas are intended solely for the use of the practical dyer. The quantities can, of course, be reduced to render them proportionate to the quantity of goods to be dyed. The source of the receipt will be indicated by a capital letter placed at the bottom of each receipt. *C.* for W. Crookes. *G.* for J. Gardner. *R.* for Reimann.

General instructions in the art of dyeing, mordants, raising agents, etc., are given before the classified receipts.

The tinctorial arts, in the widest sense of the term, include the production of color on organic fibers and surfaces of the most varied kinds—silk, hair, wool, leather, fur, feathers, bone, ivory, horn, wood, cotton, flax, jute, hemp, paper, etc.—whether in their original condition or after having undergone some manufacturing process. Where the object in view is to obtain one uniform color over the entire surface, the process is called staining, if the material taken in hand is wood, bone, ivory, or paper; and it is called dyeing if the substance is a fiber capable of being spun or woven or the threads or tissues obtained from such fibers. These distinctions, however, are not very closely observed and have no better basis than custom.

General Instructions for Dyeing.—We will first notice the vessels used to receive and contain the goods to be dyed, the coloring matters, and the water necessary to hold the latter in solution. They are called by a variety of names, as vats (German *Kuepe*)—a term generally restricted to indigo work—becks, troughs, pans, kettles, baths, "holes," cisterns, etc. The material of which they are constructed differs according to the kind of work to be done. For blacks and other dark colors, iron and copper are often employed. For bright or light shades, such as the bulk of the aniline colors, cochineal and safflower work, etc., block tin is preferable: it is not easily acted upon by such feebly acid and alkaline solutions as are used in dyeing; and if a trace of the metal is dissolved, it is not calculated to deprive the color of its luster and purity. Block tin has the further advantage that the dyer, on beginning a fresh lot of goods, can easily see whether the pan is perfectly clean. Its chief defect is the comparatively high expense.

Whether an open fire or steam is preferable is a question on which there is some difference of opinion; but where an exact regulation of heat is essential, *e. g.*, when the temperature has to be gradually raised to a boil within a certain time, or when a given degree of the thermometer must not be exceeded, steam will be found the more convenient.

The goods before being entered in the dye pan require to be thoroughly wetted; without this precaution there is danger of the color working on irregularly.

It is in most cases necessary that the goods during the process of dyeing should be kept in motion, either from time to time or constantly. One method of insuring regularity in dyeing, especially in the case of colors which work very readily on to the fiber, is to add the required quantity of dye, not all in one dose at the beginning of the process, but to divide it into portions or introduce them by degrees. Such precautions are more necessary for wool and silk than for cotton and linen, which take up most colors less readily.

Another point to be attended to for insuring evenness is to begin dyeing at a low temperature, which is gradually raised to a boil. In many of the dyeing receipts which follow this precaution is prescribed as necessary. Sometimes the various dye wares have to be all boiled up together in the dye pan at the outset, but in such cases it is mostly necessary to cool before entering the goods.

The care taken to bring all portions of the lot of goods dyed at once to the same shade of color is greater in case of yarns than of loose unspun wool and cotton wool. Any little irregularity of depth in the latter disappears when the fibers are mixed and worked up to-

gether in the mechanical operations to which they are next submitted. To such an extent is this the case that gray woolen yarns are often produced by scribbling up together undyed wool with a certain proportion of black and of deep vat blue wool and then spinning the mixture. In piece goods the necessity for perfect evenness is the greatest, since if an error is once made it cannot disappear in any subsequent operation.

As the process of dyeing a lot of goods goes on, little bits of the yarn or small swatches from the end of the piece are from time to time cut off and compared with the pattern. In case of piece goods, it is often more convenient to fasten loosely to the end or side of the piece some small swatches of the same kind of material for the purpose of examination. In comparing such trial bits with the pattern, the dyer should have the advantage of a north light—*the direct rays* of the sun being deceptive in comparing colors. He will notice whether the shade is hit, or whether a more prolonged working or the addition of a trifle more of any of the dye wares is needful. It must be remembered that no two samples of dye wares can be found exactly equal in strength, and that the appetite for color, if it may be so expressed, of wools and cottons of different growths and different seasons varies, so that the use of a fixed proportion of ware to a given weight of goods will not always give exactly the same shade. Hence constant watchfulness is needed.

In comparing the trial bit with the pattern, they are generally first placed side by side below the eye, and looked down upon, thus judging by reflected light. They are next compared "over hand," *i. e.*, they are held up to the light, and the eye is directed along the surface, thus catching the light transmitted through a portion of the fiber. A judgment must be formed quickly, as a prolonged gaze at bright colors, *e. g.*, magenta, cosine, cochineal scarlet, etc., fatigues the eye and renders it unable to perceive nice grades of difference.

When the exact shade has been hit, the further treatment of the goods varies. In most cases rinsing in water is required, sometimes at once; at other times not till the goods have had time to cool. With some particular colors rinsing is not admissible at all.

Intermediate rinsings, in the course of a drying process, are often required, *e. g.*, after the goods have been mordanted, before entering them in the color bath, the object being not to introduce into the latter any mordant, etc., which has not become attached to the fiber, but is merely held in a loose state between the threads.

It is sometimes necessary before adding either mordants or dye wares to the water to be used in a dyeing process to "clear it," by letting it boil up in the beck or pan to be used; with a little of the mordant to be employed, and carefully skimming off any impurities which rise to the surface. It need scarcely be said that if the pan is clean and the water pure, no such impurities can collect and the process is needless.

After rinsing follows the final operation, drying. This is generally performed in a room well ventilated, not too copiously lighted, and heated by means of steam pipes. Safflower shades should be dried in the dark, and without any rise of temperature, in a current of cold air.

Where the air is free from smoke, acid fumes, etc., many colors may, in favorable weather, be dried in the open air. This is very generally done with vat blues, cochineal scarlets, etc.—*C.*

Specific gravity—a very important consideration for acids, dilutions of mordants, extracts of dye wares, etc.—is expressed in this book in Twaddell's scale, as commonly used in manufacturing establishments. On this scale the specific gravity of water = 0. It is readily converted into direct specific gravity by the following simple calculation. To convert Twaddell into direct specific gravity, multiply by 5, considering the product as decimals, and add to it 1·000. Thus if a sample of oil of vitriol marks 168° = Tw., we have—

168
5
—
0·840
1·000
—
1·840 the direct specific gravity.

On the other hand, if the strength of a liquid has been taken by direct specific gravity, we find the corresponding degree Twaddell by subtracting 1·000, and dividing the remainder by 5.

Thus, if the direct specific gravity of a sample of muriatic acid be 1·160, then—

1·160
1·000
—
5)160
—
32°, the degree Twaddell.

Baume's scale, persistently used on the Continent, cannot be recommended, as it bears no simple relation either to direct specific gravity or to Twaddell.

For indicating degrees of heat the ordinary scale—Fahrenheit's—has been used.—*C.*

Mordants.—1. Alum Mordants.—Of these compounds the best known and oldest is common alum, which exists under two distinct forms, potash alum and ammonia alum. The former of these is a double sulphate of alumina and potash, containing 10 per cent. of alumina, 33 per cent. of sulphuric acid, and 45 per cent. of water. Three-fourths of the water is driven off at the heat of 140° F. One part of alum, at 54° F., dissolves in thirteen times its weight of water, in twice its weight at 122° F., and at 189° F. in less than one-tenth of its own weight.

The most important of the aluminous mordants for the cotton dyer and tissue printer is the acetate of alumina, known also as pyrolignite of alumina, red mordant, and especially as red liquor.

The following receipts are given by D. Kochelin:

	No. 1.	No. 2.	No. 3.	No. 4.
Water (gallons). ..	45	45	45	45
Alum (lb.)..... ..	100	100	200	190
Sugar of lead (lb.)..	100	129	200	190
Soda crystals (lb.)..	10	10	10	19

The way of mixing is as follows: the alum is broken up and dissolved in the water at 140° F., the soda crystals are next added and stirred till dissolved, and the sugar of lead is then added in a coarse powder and stirred for a long time, repeating the stirring from time to time during two or three days. Of these mordants Nos. 1 and 2 are for calico, No. 1 being less suitable for gum colors than No. 2. Nos. 3 and 4 are suitable for muslin.

The two following red liquors are made from acetate of lime:

Acetate of lime, at 24° Tw.	50	90 gal.
Alum	200	— lb.
Sulphate of alumina.....	—	272 lb.
Ground chalk..... ..	12	34 lb.

To prepare these liquors the acetate of lime is first heated to 140° F., the alum or sulphate of alumina is then added and stirred till dissolved, and the chalk is added by degrees. The mixture is well stirred till nearly cold, let settle, the clear liquid decanted off, and the sediment drained on a woolen filter.

The first of these mixtures gives the deepest red in madder work, and the second is for mixing with black liquor to produce chocolates.

For a "resist" red liquor take—water, 1 gal.; alum, 5 lb.; sugar of lead, 2½ lb.; crystals of soda, ¼ lb.

Dissolve the alum and the soda crystals in one portion of the water and the sugar of lead in the other. When dissolved mix, let settle, and draw off the clear.—*C.*

Mordant, alum, an alum, with one-fourth its weight of tartar, acetate of alumina. This is commonly prepared in a solution for the purpose; 100 parts of alum, in solution, with 150 parts of pyrolignite of lime of 20° density, is sometimes employed [not recommended].

A solution of alum with crystallized carbonate of soda, in the proportion of 1 oz. to each lb. of alum.

This is a solution of alum with sufficient strong solution of caustic potash to redissolve the precipitated alumina, to which mixture a portion of linseed oil is added.

To 50 gal. of boiling water add 100 lb. of alum; dissolve, and add slowly 10 lb. of crystallized carbonate of soda. When the effervescence is over, add 75 lb. of sugar of lead.

Antimony Mordants.—The double tartrate of antimony and potash, commonly known as tartar emetic, is used to some extent in fixing the aniline colors in conjunction with tannin. Its price and its evil reputation as a poison are difficulties in the way of its more extended use.

A cheaper compound lately used in dyeing is the "oxymuriate" (not oxychloride), or muriate of antimonic oxide, made by dissolving the black sulphuret of antimony in strong boiling muriatic acid. It gives bad results if, as is frequently the case, it is contaminated with iron.

The behavior of antimony with coloring matters has not yet been sufficiently studied.

Arsenical Mordants.—Arsenic in many cases plays the part of an alterant rather than of a mordant. Arsenite of soda, along with red liquor, is very frequently used in printing aniline colors upon cotton. The result of the reaction is the production of an insoluble arsenite of alumina which attaches itself to the fiber, and in which the coloring matter is entangled.

Chromium Mordants.- Chromium yields two distinct classes of mordants, both of extensive use. In the state of chromic acid, combined with potash or with soda, it plays a very important part along with the woods in dyeing blacks, browns, bottle greens, olives and a variety of sad colors. There are two chromates of potash, the bichromate, red chromate, bichrome, and sometimes merely chrome, being the most generally employed.

Copper Mordants.—Acetate of copper, commonly known as verdigris, is met with of different kinds, the principal of which are the blue and the green. Both these compounds, are or were chiefly imported from the south of France. Verdigris, however, is very commonly made in the liquid state by a process very similar to the preparation of red liquor. In, *e. g.*, a gal. of water at about 160° F., 4 lb. of bluestone and 4 lb. sugar of lead are dissolved with frequent stirring. When this is completed the liquid is left to settle and the clear is decanted off for use.

Verdigris is used in printing and dyeing blacks on silks and on hats; in logwood blues on woolens; in catechu colors, where it acts as an oxidizing agent, in resists for dip blues, and in certain steam colors.

Iron Mordants.—The compounds of iron play a very important part in dyeing and printing processes, chiefly for the production of the darker and sadder shades—blacks, browns, olives, chocolates, curtain blues, and violets, etc. They are much better applicable to cotton and silk than to wool.

The iron compound most commonly used in printing is the acetate or pyrolignite, known more generally as black liquor, iron liquor, or sometimes confusingly as black iron.

Black liquor as commonly met with in commerce has a specific gravity ranging from 18° Tw. to 28° Tw. It has an olive color, a peculiar tar-like smell, and an inky taste. It is sometimes made by mixing together solutions of the acetate of lime, or of brown sugar of lead, and of copperas, and after letting the mixture stand to settle, drawing off the clear for use.

A persulphate of iron (ferric sulphate) or red sulphate is sometimes employed. It is generally made by adding to a solution of copperas half as much sulphuric acid as it already contains, *i. e.*, 18% oil of vitriol, and heating the mixture, adding from time to time small quantities of nitric acid to peroxidize the iron.

It forms a pale yellow solution.

Black Mordant.—A mixture of bichromate of potash with refuse saline matter, and with some boneblack of low quality, ground to a fine powder.

For pale blue upon silks, or for blues which have to be converted into greens, many dyers prefer a blue iron made from the metal in the following manner:

Double aquafortis, 64° Tw., is let down with water to half strength. A quantity of this is put in a stoneware bowl, and clippings of clean sheet iron are added so long as they dissolve rapidly with the escape of reddish vapors. The finished product should stand at about 43° or 44° Tw.

If iron is still added after the escape of orange vapors has ceased, the product will be mainly a yellowish mud, of no use in dyeing.

Iron filings or turnings and rusty or greasy iron must not be used.

For deeper and richer shades of blue, either of the two following blue irons may be taken:

a. Nitrate of soda, refined, 24 lb.; oil of vitriol, 20 lb.; water, 15 gal. Scrap iron as required.

b. Nitrate of soda, 16 lb.; oil of vitriol, 20 lb.; cold water, 13 gal. Scrap iron as required.

In either case the nitrate of soda is first dissolved in the water, and the oil of vitriol and the iron are added by degrees. A brisk action must be kept up, but the heat should not be let become excessive. These preparations should not be made in very large quanties at a time, as they do not keep well. The nitrate of soda used should be free from common salt—chloride of sodium.—*C.*

Tin Mordants.—No mordants are more important or more widely used than those prepared from tin. We have in the first place those containing tin in its lowest stage of oxidation, or as a corresponding chlorine compound. Of these preparations, the most important is the solid protochloride or muriate, more correctly named stannous chloride, but known in the trade as tin crystals, and sometimes tin salts. This substance is made on the large scale by dissolving granulated tin of the best quality in muriatic acid, which should be free from iron, arsenic, sulphuric and sulphurous acid, and other impurities. Heat is applied to the mixture, and when the acid is saturated the liquid is run off and allowed to crystallize. The crystals form fine needle-like particles, white, and of a silky luster. They attract moisture from the air, and should therefore be kept in a dry place. The following are examples of some of the most generally used tin mordants: Purple, plum, or puce spirit; muriate of tin, 70° Tw., 2 gal.; let down oil of vitriol with *water till* the mixture marks 28° Tw., and when cold add 1 gal. Stir well together.

Oxalate of Tin, sometimes named "Ox Tin."—A true oxalate of tin is not known in trade, but the name is given to mixtures of muriate of tin with sulphuric acid and oxalic acid, or oxalate of potash. A preparation of this kind may be made from the plum spirit above mentioned by adding 1 oz. oxalic acid, first dissolved in hot water, per gal. These preparations are exclusively used in wool dyeing.—*C.*

Scarlet Spirit.—*For cochineal and lac* scarlets upon woolen and worsted goods the following is one of the many preparations which have been in successful use. Some dyers apply it at once along with the cochineal or lac, etc., while others first "ground" with another preparation to be mentioned below (bowl spirits), and

merely top, raise, or finish with the following spirit: Muriate of tin, at 54° Tw., 3 qt.; oxalic acid, ¼ lb.; previously dissolved in hot water enough to reduce the whole to 40° Tw.—*C.*

Yellow and Orange Spirit.—Double muriate of tin, at 80° Tw., 59 oz.; oil of vitriol, 2 lb.; water, 2 lb. Mix and let cool before adding to the double muriate.—*C.*

Mordants of the perchloride of tin, however prepared, are used principally in cotton and silk dyeing, their applications in woolen dyeing being much less numerous. Formulæ for preparing some of the principal of these spirits are here given:

Crimson Cotton Spirits.—Muriatic acid, at 33° Tw., 7 gal.; aquafortis, at 64° Tw., 1 gal.; water, 1 gal.

Put the liquids in a stoneware, jar-shaped pan with upright sides, rather narrower at bottom than at top. Pour in the water first, then the muriatic acid, and lastly the nitric acid—an arrangement which facilitates perfect mixture. Stir well with a glass or stoneware rod, and let stand for about ten minutes.

Meantime weigh out 6 lb. of grain bar tin, which is not to be feathered or granulated as in making tin crystals or double muriate. Put in about six rods in an upright position, arranging them at equal distances around the sides of the vessel. As these dissolve, the remainder of the rods must be gradually added. If the weather is hot, the number of rods entered at first may be reduced to four or five, while in winter as many as eight or nine can be put in at once.

No artificial heat must be applied, and the liquid must never be stirred while working. If, however, the action grows too strong, one or more rods may be quietly withdrawn and returned when the heat has somewhat subsided. This is not difficult, as with the proportions above given the ends of the rods will project a little above the surface of the liquid.

If working rightly, the surface of the liquid will show a very slight creamy froth, but if large bubbles form and throw off orange colored fumes, the heat is too great and "firing" is at hand. The process lasts from eight to ten hours, according to the weather. When complete the liquid should be clear, without any sediment, and of a very pale straw color. If it is perfectly colorless, then, except absolutely pure muriatic acid has been used—which is commercially impracticable—a portion of the tin is still in the state of a protochloride. On standing for a day or two the straw color appears, beginning at the surface.

As a means of regulating the action according to the temperature, the water may be reduced in quantity, and in very severe weather may be omitted altogether. In such cases the usual proportion of water is added to the finished product, so that the strength may be unaltered.

This mordant is used for dyeing wood reds, crimsons, etc., on the cotton warps of mixed goods, and serves for a great variety of colors upon cotton yarns.

1. Red Cotton Spirits.—Muriatic acid, 32° Tw., 6 gal.; aquafortis, 64° Tw., 1 gal.; water, 1 gal.; tin, 6 lb. Dissolve as above. Recommended for brown and claret warps of mixed piece goods.

2. Red Cotton Spirit.—Muriatic acid, 32° Tw., 6 gal.; aquafortis, 64°, Tw., 2 gal.; tin, 10 lb. Great care is here required in working to prevent firing.—*C.*

3. Red Cotton Spirit —Muriatic acid, 35° Tw., 8½ gal.; aquafortis 64° Tw., 1½ gal. Tin sufficient to bring up the specific gravity to 54° Tw. When the tin is dissolved, add 1 oz. bichromate of potash.—*C.*

Barwood Spirit.—Muriatic acid, 32° Tw., 5 gal.; aquafortis, 64° Tw., 1 gal.; tin, 1 oz. per lb. of the mixed, or about 5 lb. Dissolve as above. This spirit is used in dyeing barwood reds—*C.*

Plum Spirit.—Muriatic acid, 32 Tw , 6 gal.; aquafortis, 64 Tw., 1 gal.; tin, 1½ oz. per lb. of the mixed acids, or about 8½ lb.—*C.*

"Solution" is a name given in certain districts to preparations much resembling the red cotton spirits, and used for similar purposes.

Solution No. 1.—Muriatic acid, 32 Tw., 6 gal.; aquafortis, 64° Tw., 1½ gal.; water, 1 gal.; tin, 7 lb. Work with the same precautions. This spirit serves for cotton dyeing mixed clarets, browns, etc.—*C.*

Solution No. 2.—Muriatic acid, 32° Tw., 6 gal. aquafortis (single), 32° Tw., 3 gal.; tin, 10½ lb. This solution requires very careful working, and when well made has been serviceable for fixing various aniline colors upon cotton.—*C.*

Purple Cotton Spirit.—Muriatic acid, 32 Tw., 5 lb.; aquafortis, 64 Tw., 1 lb., tin, ¾ lb. To every 9 gal. of the solution add 2 oz. bichromate of potash, dissolved in water.—*C.*

The following compounds, generally known as "oxymuriates," are used in printing: 1. Muriatic acid, 32 Tw., 20 lb.; water, 2 gal.; sal ammoniac, 5 lb.; tin, 10 lb.—*C.*

2. Dissolve 16 lb. tin crystals in a stoneware bowl, set in a larger vessel of hot water. Add very gradually 20 lb. aquafortis, 64° Tw.—*C.*

3. To 60 lb. tin crystals, add 1 qt. water, and heat in a water or steam bath till dissolved. Add 92 lb. aquafortis at 60° F. by portions, taking care that the action does not become too violent.—*C.*

4. Muriatic acid, 34 Tw., 11 lb.; aquafortis, 62 Tw., 5 lb. Dissoive in the mixture 2 lb. of feathered tin. This preparation is frequently used in spirit styles. The oxymuriate, 2, is ployed in "cutting" madder pinks, that is, for reducing the reds in the clearing process down to the bright shade required.—*C.*

Pink Salt, the double chloride of tin and ammonium, is prepared by mixing saturated solutions of sal ammoniac and of perchloride of tin (stannic chloride), when the pink salt falls to the bottom of the vessel as a white powdery precipitate; it should contain 70 per cent. of the perchloride of tin and 30 per cent. of sal ammoniac. It dissolves in three times its own weight of water at 60° F., and if boiled in a weak solution it is decomposed and the whole of the tin is deposited. Pink salt is valuable as a solvent for organic coloring matters, and though at present neglected, will doubtless receive important applications in the future.—*C.*

Aniline Spirit, so called from its uses, is made with single aquafortis, 32° Tw., 5 gal.; muriatic acid, 32° Tw., 2½ gal.; tin, in the rod, 12 lb. The acids are mixed and about 12 bars of tin are entered at once, working as directed for "red cotton spirits" till all is taken up. This spirit is of a deep reddish amber, and contains about 2 oz. tin per lb. of acid. It is very useful in cotton dyeing.—*C.*

Mordant, a Protochloride of Tin.—1. To strong muriatic acid add gradually small pieces of grain tin till no more is dissolved. It may be obtained in crystals by evaporation. In dissolving them, it is necessary to add to the water a few drops of muriatic acid.

2. Perchloride of Tin.—Mix 1 measure of nitric acid with 4 measures of muriatic acid, and add tin in small quantities as long as any is dissolved. Or mix 4 oz. of muriatic with 1 oz. of nitric acid and 1 oz. water; dissolve in it, by small portions at a time, 2 drm. of grain tin.

3. Aquafortis (or equal portions of nitric acid and water), 8 parts; sal ammoniac, 1 part; mix, and add gradually 1 part, or as much as it will dissolve, of grain tin.

4. Dr. Bancroft's.—Digest 2 parts of tin with 3 parts of strong muriatic acid for an hour. Add very cautiously 1½ part of sulphuric acid. Keep up the heat as long as hydrogen is evolved; on cooling, it crystallizes. Dissolve this in salt and water, so as to form a solution containing 1 part of tin in 8.

5. New Tin Crystals.—Add 3 lb. of sal ammoniac to 1 gal. of solution of tin; evaporate and crystallize.

6. Mordant for Lac Dye.—Mix 27 lb. of muriatic acid with 1½ lb. of nitric acid (sp. gr. 1·19), put it into a stone bottle, and add tin in small bits, till 4 lb. are dissolved.

7. Stannate of Soda.—Digest litharge, 36 parts, or minium, 27 parts, in a metallic vessel, with a soda lye of $1\frac{35}{100}$ density; when dissolved, 8 parts of tin in grains are gradually added. The lead separates at once in a spongy state, and the solution of stannate of soda may be decanted.

8. Lac Spirit.—Used as a solvent for lac dye, in preference to muriatic acid alone, is thus made. Add gradually 3 lb. of tin to 60 lb. muriatic acid. Digest ¾ lb. of this solvent on each pound of the dye for six hours. Plum or puce spirit, peach spirit, and grain or scarlet spirit, are names given by dyers to different solutions of tin employed in dyeing these colors. For scarlet, the nitro-muriatic solutions (Nos. 2 and 3, above) are used.

9. Iron Liquor.—Scraps of iron are placed in casks or other vessels, and covered with rectified raw pyroligneous acid. There are usually a series of vessels, through which the solution is successively passed till it is fully saturated.

Raising Agents.—Both in dyeing and printing, chiefly as regards madder work in the latter, after the color has been fixed on the fiber or tissue, it is submitted to a final process known as "raising," blooming, brightening (French *avivage*, German *schoenen*). This is effected in very different manners, according to the nature of the case. Sometimes the goods are taken through a weak acid, or a weak solution of a tin mordant. Sometimes, again, as in the case of madder work with the root, successive soapings are applied. In many cases a small quantity of a brighter and more beautiful, though often less fast, color is either added to the dye beck toward the close of the operation or the goods are passed through it in a separate bath. The process is then generally known as "topping," and is effected by means of magenta, saffranine, the aniline violets, the orchil colors, etc., applied upon a ground got up with the woods, etc. Goods thus "topped" very frequently lose their beauty after a short exposure to air and sunshine.

Leveling Agents.—It is sometimes necessary to add to the dye beck a body which, instead of promoting the adhesion of the dye to the fiber, has the very opposite effect. There are certain colors which combine so eagerly with the goods to be dyed, that it is difficult to get an even shade, the portions first immersed into the dye liquid taking up more than their share. This is particularly the case in dying wool with certain of the aniline colors. To prevent this inconvenience, and to cause the color to be evenly distributed over the whole surface to be dyed, a quantity of the crystallized sulphate of soda, otherwise known as Glauber's salt, and in many dye houses as Sally Nixon—a corruption for sal enixum—is added. This salt diminishes the affinity of the color for the fiber, so that it is deposited slowly and evenly. Many other neutral salts would have the same effect; but the sulphate of soda is preferred as being cheap, readily procurable, and having little action upon the tone of the dye wares. Upon certain colors, *e. g.*, those of the woods, it acts as a feeble alkali.

Bristles, to Dye.—Steep them for a short time in any of the common dyes used for cotton or wool.

Cotton Dyeing.—The "affinity" of cotton for coloring matters is generally feebler than that of silk or woolen. Few dye wares play, with it, the part of substantive colors, *i. e.*, attach themselves to it without a mordant, safflower red and reduced indigo (in the vat) being the best known exceptions. Cotton bears contact with alkalies much better than silk or wool, and is in return much more readily injured by strong acid solutions. Hence it can be dyed by the help of the stannates, plumbates and aluminates of soda. Containing no sulphur, there is no fear of its blackening preparations of lead, tin, etc. It easily takes oxides of iron, manganese, etc., from their solutions and can thus be dyed a variety of shades, as browns, bronzes, buffs, blacks (by treatment with iron and a subsequent passage through an astringent, etc.), Prussian blues, copper bluish greens, lead yellows and oranges. On the other hand, certain organic colors, such as picric acid, the weed products, *i. e.*, orchil and cudbear, cannot be worked upon cotton without the aid of animal mordants. The aniline colors are fixed upon cotton by means of tannin, alizarine oil and the mixed mordant of acetate of alumina and arsenite of soda. Aniline black, however, gives much more satisfactory results upon cottons than upon woolens. In cotton dyeing the goods are worked in the mordant, as a rule, first, before being immersed in the dye liquids. Cotton is also generally dyed at lower temperatures than wool; often at about 90° to 100° F., and very frequently in the cold.—*C.*

Benzo-purpurine, 4 B., on 100 lb. of unbleached cotton yarn. Start dye kettle with 4 lb. benzo-purpurine, 4 B.; 25 lb. Glauber's salt, 2 lb. sal soda. Enter yarn at boil and boil for one hour while turning. Lift out, wring and dry. For standing kettles use ½ less color.

Benzo-purpurine, 10 B., on 10 pieces cotton flannel, each piece weighing 10 lb. Prepare dye kettle with 3 lb. benzo-purpurine, 10 B.; 4 lb. soap, 1 lb. sal soda. Enter goods at boil and run for one hour at that heat. Lift out and rinse off.

Aniline Black on Cotton Yarn (100 lb.).—Mix 6 lb. 9 oz. aniline oil with 8¾ lb. muriatic acid at 32° Tw. Let cool and add the solution of 4 lb. 6 oz. chlorate of potash in 66 parts of water. Then add 43¾ pt. of chloride of iron at 30° Tw. The yarns, previously bleached, are placed for 8 to 10 hours in this mixture, which must be previously let down with a sufficient quantity of water at about 100° F. Lift and place the yarns in soda solution at 21° Tw. for half an hour to neutralize the excess of acid. Wash and steep for half an hour in 33 qt. of water and 7 oz. chromate of potash at about 112° F. This beck gives the dye more permanence and prevents "greening." Wash and work in the following mixture: Alizarine oil, 17½ oz.; potash, 2 lb. 3 oz.; water, 35 qt. Dry at once. This process may be used for linen, hemp, jute or silk, as well as for cotton, whether in yarns or pieces.—*C.*

Another Aniline Black.—For each pound of cotton yarn take 3½ of bluestone dissolved in water, made very feebly acid with muriatic acid. Give seven turns and wring well. Dissolve ½ lb. hyposulphite of soda per gal. water at 120° F., 5 turns and wash well. Dye cold in chlorate of potash, 3 oz.; sal ammoniac, 3 oz.; muriate of aniline ½ lb., in sufficient water, seven turns quickly and wring well. Hang up even at 77° F. for forty-eight hours and raise to 84° F. Take through either bichromate or weak soda lye and wash well. If reddish when dry, take through a very weak chloride of lime water.—*C.*

Another Black (220 lb.).—Boil for three hours with 88 lb. extract of logwood; lift, wring and dry. Dissolve in cold water 33 lb. chromate of potash and 17½ lb. bluestone; enter and turn for an hour. Lift and return to the logwood beck at 140° F., after having previously added 17½ lb. soda ash. Work for two hours, and sadden with 11 lb. copperas.—*C.*

Blue Black for Sewing Cotton.—Boil the yarn and ground with sumac; mordant, wring out, and run through black liquor at 2° Tw. Raise with clear lime water, and wash in cold water. Sadden with logwood liquor and copperas in the same liquor, and it is then ready for sizing and polishing.—*C.*

Good Black (60 lb.).—Boil 12 lb. cutch with 1½ lb. bluestone; put the yarn down in this all night; work in the morning in a clear lime water; then add 6 qt. black liquor to a cold

water, give four turns in this; work again in clear lime water, and wring up. Boil 30 lb. ground logwood and 6 lb. fustic; add the decoction to a hot water, work yarns six turns, lift, and add 1 qt. black liquor, and wash off with the addition of a little oil and soda ash, if wanted soft. Into the logwood water are now put 10¼ oz. soda ash; enter, give ten turns, lift, and add 3½ oz. copperas; five turns more, and the dyeing is complete. It is well to leave the yarn in a heap for six hours after the logwood bath before passing into the lime water.—*C.*

Fast Black (100 lb.).—Dissolve 24 lb. extract of logwood in a hot water; add 1½ lb. bluestone; enter the yarn, give a few turns, and wash. Add to a fresh cold water 2 lb. bichromate of potash and 1½ lb. nitrate of iron. Take the yarns through this and back again to the first water, to which have been meantime added 2 lb. soda crystals and the same weight of olive oil.

Black on Cotton Wool, to stand Fulling (60 lb.).—Extract of logwood, 14 lb.; extract of bark, 1½ lb.; bluestone, 4 lb. Dissolve at a boil; enter the cotton wool, boil for 1½ hours, and let stop in the liquid overnight. Lift, let lie in heaps for two days; enter in a cold water containing copperas, 8 lb.; lixiviated chalk, 2 lb. Take out after two hours, let lie a day or two, rinse and raise at a hand heat with oil and soap.—*C.*

Black (11 lb.).—Dissolve in a water 1 lb. 1½ oz. solid extract of logwood and 1¾ oz. extract of bark. Boil the yarn in this liquid till thoroughly saturated. Lift, wring, and enter in a fresh water with 7 oz. quicklime. Five turns, wring and enter in a water with 1 lb. 1½ oz. copperas; ten turns and lift.—*C.*

Tête de Nègre.—For 100 lb. bleached cotton, 5 lb. catechu; 2 lb. alum; 1 lb. blue vitriol; 2 lb. bichromate. Work as in yellow cannelle. Finish with 40 lb. red sanders and one tumbler of pyrolignite of iron for each 25 lb. cotton.

Another Black (60 lb.).—Boil 12 lb. sumac; steep yarns overnight with the decoction, and work as in the last receipt. If a bluer shade is wanted, omit the first lime water.—*C.*

Logwood Black (60 lb.).—Boil 5 lb. logwood extract and 1½ lb. bluestone; put down yarns in this all night, and work the next morning in 6 qt. black liquor in cold water. Work in a clear lime water and wring. Then boil 5 lb. logwood extract, ¼ lb. fustic extract, and add to a hot water, work yarns for half an hour, lift, and add 2 lb. copperas; wash and dry.—*C.*

Another Black (60 lb.).—Boil 6 lb. logwood extract, ½ lb. fustic extract, and add to a boiling water; work yarns for an hour, lift and wring. Dissolve 1 lb. chrome (bichromate of potash) and 1 lb. bluestone, add to a cold water, give four turns, let off and wring; add 2 lb. soda crystals to the logwood liquor, give four turns, lift; add 3 lb. copperas, four turns more, wash and dry.—*C.*

Common Black (60 lb.).—Work in lime water and wring, then with 6 qt. black liquor in a cold water and wring. Lime again in a clear lime water; boil 24 lb. ground logwood, add the decoction to a hot water, work five turns, lift, and add 2 lb. copperas; five turns more; wash and dry.—*C.*

Black for Sewing Thread (55 lb.).—Boil out 11 lb. sumac in water. Steep for a night in the boiling liquid; lift, work an hour in black liquor at 14° Tw. Lift and hang out five or six hours. Make up a fresh cold water with 17 oz. lime and 8¾ oz. chromate potash, and work the thread till it is of a level brown color. Rinse and dye at 190° F. with 16 lb. 5 oz. logwood, working for fifteen minutes. Rinse.—*C.*

Fast Blue Black on Cloth or Yarn.—Give a ground in the vat, take through vitriol sours, and wash well in cold water. Work the goods in sumac, and then pass into a water with 4 qt. copperas liquor at 10° Tw. Wring and raise with lime water or bichromate of potash, wash and enter into a logwood bath at 160° F., add 2 qt. copperas water at 10° Tw., and run through again. Wash, and then repeat the process with the logwood and copperas. If not blue enough, add a little bluestone along with the copperas. Piece goods require three or four turns, and yarn five or six turns in every operation.—*C.*

Blue Black.—Blue black on 10 pieces cotton flannel, each piece weighing 6 lb. 1. Run for three-quarters of an hour in a bath of 16 lb. extrac sumac, and wring.

2. Run for thirty minutes through a cold bath of 6 qt. nitrate of iron, and wash off.

3. Run for thirty minutes through a hot bath of 15 lb. extract of logwood, 51°.

4. Run for thirty minutes through a cold bath of 2 lb. copperas, and rinse off.

Common Black.—5 pieces = 75 lb. are padded through acetate of iron (iron liquor) at 8° Twaddell, dried, and afterward passed through lime water (milk of lime); afterward washed, then dyed with 35 lb. ground logwood and 3 lb. fustic extract at 48° Tw.; in this they are worked for half an hour at boil; then winched, rinsed, and dried. They are further run through a little starch water containing a small quantity of soap, and then dried for finishing.—*G.*

Good Common Black (Carlisle Finish).—7 pieces = 85 lb. are worked in the jigger, cold for 6 ends, and afterward passed through a water mangle to squeeze out a large portion of the liquor; then dried; they are then padded in acetate of iron at 8° Twaddell, and dried out of it; afterward again entered into the jigger, which is charged with sufficient water and 5 lb. chalk (carbonate of lime); give two ends; then wash, and afterward dye with 48 lb. ground logwood and 3½ lb. fustic extract at 48° Twaddell; work in the jigger for forty-five minutes at boil; wash and dry.

Chrome Black (Italian Black).—6 pieces satin (cotton) = 108 lb. Work in jigger containing 20 lb. sumac (Palermo), and 20 lb. myrobolans, in as little water as possible, and at boil for 7 to 8 ends; then run off the liquor and recharge the jigger with 15 gal. water and 5 lb. sulphate of copper, cold; give 4 ends in this; again wash well, and recharge the jigger with bichromate of potash at say 2° Twaddell; give 2 ends cold, and then 3 ends at boil, again wash, and afterward dye in the jigger, it being recharged with 72 lb. ground logwood and 4½ lb. fustic extract at 48° Twaddell; work backward and forward at boil for one hour; then rinse in a weak solution of soda or potash, say 8 oz. to 20 gal. water; wash and dry.—*G.*

Black.—1. The goods, previously dyed blue, are steeped for about twenty-four hours in a decoction of gall nuts or sumac, then drained, rinsed in water, and passed through a bath of acetate of iron for a quarter of an hour; they are next again rinsed in water, and exposed for some time to the air; after which they are passed a second time through the bath, to which a little more iron liquor is previously added. The whole process is repeated, if necessary, according to the intensity of the shade of black desired.

2. The goods are steeped in a mordant of acetate of iron, worked well, and then passed through a bath of madder and logwood for two hours. Less permanent than No 1. About 2 oz. coarsely powdered galls, or 4 oz. sumac, are required for every lb. cotton, in the process of galling. The first should be boiled in the water, in the proportion of about ½ gal. water to every 1 lb. cotton. The sumac bath is better made by mere infusion of that dye stuff in very hot water.

3. For 10 lb. Cloth.—The goods are put into a boiling bath made of 3 lb. sumac, and allowed to steep, with occasional "working," until the liquor is perfectly cold; they are next passed through lime water, and, after having drained for a few minutes, immediately transferred to, and "worked" for an hour, in a warm solution of 2 lb. copperas; after free exposure to the air

for about an hour they are again passed through lime water, and after draining, "worked" for an hour in a bath made of 3 lb. logwood and 1 lb. fustic; they are then "lifted," and ¼ lb. copperas being added, they are returned to the bath, "worked" well for about half an hour, and finished. Good and deep.—*G.*

Bright and Very Deep Black.—Boil in a water solid extract of logwood, 8 lb., and extract of bark, 1 lb., for half an hour. Dissolve in the liquid bluestone, 1 lb.; enter in the hot liquid and work for an hour; raise to a boil and work for half an hour longer. Make up another hot water with bichromate of potash, 1 lb., and common salt, 3 lb.; enter yarns, work well, let cool, and wash. The liquid of the last bath should have a brown color, but if it appears rather black, a little bluestone must be added. —*C.*

Another Bright Black, 10 lb. — Prepare a water with logwood extract, 1 lb., and fustic extract, 5 oz.; boil yarn in this bath for fifteen minutes, and let stand overnight. The next morning lift, wring, enter in a water with bichromate of potash, ¼ lb., and bluestone 1¼ lb.; work for fifteen minutes, lift and wring. To the first, logwood, bath add soda crystals, 2 oz.; enter and work yarn for half an hour; lift, wring, and return to the bichrome bath, to which 2½ oz. copperas have been previously added; wring again, and return to the logwood bath for half an hour; lift, wring, and dry without washing. It is finished brighter by taking once more to the logwood bath, to which has been previously added a mixture made up of olive oil, 1 oz., water, ½ pt., and soda ash, 1 oz., beaten up to an emulsion.—*C.*

Blue Black on Cotton Velvets, 10 lb. — Work in a boiling soda water which when cold would mark 2½° Tw. Rinse; steep overnight in the decoction of sumac, 2 lb.; lift, drain, and work for fifteen minutes in black liquor at 6¾ Tw. Work for another fifteen minutes in a cold water, with alum, 1 lb., and bluestone 1 lb.; rinse and dye at 122° F., with logwood, 2 lb., and bark, ½ lb., for fifteen to thirty minutes. To soften the goods take them through an emulsion of olive oil, ½ lb., and a solution of potash, 2½ oz. Dry.—*C.*

Sumac Black, 110 lb.—Prepare with sumac, 22 lb., overnight, at a boil; enter in a fresh water with copperas, 15¼ lb., and precipitated chalk, 35 oz. Work cold for an hour, lift, and expose to the air. Make up a fresh water with quicklime, 6½ lb., and work till the goods are an even brown all over. Rinse well and dye in a fresh water at 167° F. with logwood, 55 lb., and bark, 11 lb. Sadden in the same water with copperas, 35 oz.—*C.*

Light Blue on Cotton Wool, 50 lb.—Steep for some hours in the hot clear decoction of sumac, 8 lb.; lift, drain, and enter in a water at 167° F. containing the clear solution of Nicholson blue, 4 oz. Work for half an hour, lift, add to the hot alum, 5 lb., previously dissolved; re-enter the cotton wool, and work at 102° F. for half an hour; drain and dry.—*C.*

Blue on Cotton.—Cotton yarn, 100 lb.—Prepare with alum, 8 lb.; tartaric acid, 8 oz.; sal soda, 4 lb.; aniline cotton blue BB, 14 oz. (Lutz & Movius). Enter hot, turn for twenty minutes, take out, raise temperature to boiling, re-enter and turn to shade.

Note.—For second lot of cotton yarn, 100 lb., use alum, 6 lb.; tartaric acid, 6 oz.; sal soda, 3 lb.; and blue BB, 10 oz.

Böttger suggests the following process for dyeing cotton pure blue: Heat a mixture of Paris blue, 137 grn.; tartaric acid, 137 grn.; ammonia water, ½ fl. oz.; and water, 2½ fl. oz., and filter after cooling. Add to the deep blue filtrate a solution of caustic soda, until it is decolorized and after some time assumes a light yellow tint. Impregnate the cotton with this solution and pass it (best after allowing it to dry) through a warm, very dilute solution of sulphuric acid, and it will immediately assume a beautiful blue color, and needs only to be washed in water. The sulphuric acid may be so diluted that it has scarcely a perceptibly sour taste.

Methylene Blue.—Work in a solution of tannin, and wring well, take through tartar emetic, and wring again. Pass into a soap water, after which it is washed well. Enter in a cold water which is gradually raised to a boil, while the dissolved coloring matter is added by degrees. If a greener tone is required, top with bark liquor; or, if a redder tone is needed, top with a reddish aniline blue, or even with methyl violet.—*C.*

Aniline Blue (soluble in spirit) of the Berlin Aktien Gesellschaft (11 lb.).—Boil 35 oz. sumac or 2,790 grn. tannin in water, filter and dissolve 17½ oz. curd soap in the clear solution, and enter the cotton overnight in the hot liquid. Wring out and make up a water at 2½° Tw., with red liquor, to which the clear solution of the color is added according to the shade. Enter the yarn and dye, heating to a boil for some time.

Aniline Blue (100 lb.).—Alum, 8 lb.; tartaric acid, ½ lb.; soda ash, 4 lb.; aniline cotton blue, 14 oz. Enter hot, turn for twenty minutes, lift, raise to a boil, re-enter, and dye to a shade. —*C.*

Benzyl Blue.—Prepare with sumac or tannic acid in the usual way. Dissolve the color in 100 parts of boiling water, and add the requisite quantity to a lukewarm water.—*C.*

Guernsey Blue (10 lb.)—Prepare with 2 lb. sumac; dye at 88° F. with the solution of 2 lb. Guernsey blue; lift, add 1 lb. alum, re-enter, give a few more turns, take out and dry.—*C.*

Blue Cotton Satin (100 lb.).—Run for an hour through a hot cistern, made up with 17 oz. sumac, 6½ oz. soap, and the same weight of rape oil. Make up a fresh boiling water with 5½ lb. ground alum and 6¼ oz. Nicholson blue, and run through this to shade. For the finishing take, to make up 175 pt., 5 lb. 7 oz. gum tragacanth, and dissolve it in water, adding the clear solution of 1 oz. Nicholson blue and 5½ lb. alum. Stir into the hot mixture 17 oz. stearine and 5 lb. 7 oz. glycerine. Apply hot, dry and calender.—*C.*

Navy Blue (11 lb.).—Boil 2 lb. 3 oz. logwood, and dissolve in the clear, hot decoction 26 oz. curd soap. Steep the yarn in this liquor for two hours at 167° F. Lift, add to the same water 26 oz. copperas, re-enter yarn, and work till the color is even. Wash in cold water and work in a fresh water with 17 oz. curd soap for an hour at 144° F. Make up a boiling water with 2½ oz. of an aniline blue soluble in spirit, and 2 lb. 3 oz. red liquor at 14° Tw. Work the yarn in this at a boil till the shade is obtained, and rinse.—*C.*

Dyeing and Finishing Blue Cotton Satins (100 yd.).—Run the goods for an hour through a hot cistern made up with 1 lb. 1½ oz. sumac, 6¼ oz. soap, and the same weight of rape oil. Make up a fresh boiling beck with 5½ lb. ground alum and 6¼ oz. Nicholson blue, and run through this to shade. For the finishing, take, to make up 175 pt., 5 lb. 7 oz. gum tragacanth, and dissolve it in water, adding the clear solution of 1 oz. Nicholson blue and 5 lb. 7 oz. alum. Stir into the hot mixture 17¼ oz. stearine and 5 lb. 7 oz. glycerine. Apply hot, dry and calender.

Dyeing Blue Gray on Gauze.—For 22 lb. stuff, take through a water containing 17 oz. sulphuric acid, and rinse well; and then at 176° F. through a fresh beck of 3¼ oz. nigrosin and 2 lb. 3 oz. alum, and dry.

Blue without Indigo (55 lb.).—Boil with soda, rinse and dry. Boil 4 lb. 6 oz. starch in 11 qt. water, and add after cooling chlorate of potash, 10½ oz.; chloride of copper, 20¾ oz.; muriate of aniline, 2 lb. 10 oz. 35 oz. of the cotton are passed five or six times through 17 fl. oz. of this mixture; another 17 fl. oz. is then added, and a second 35 oz. of the cotton passed through, and so on till all is used up. The cot-

ton is then aged by heating in a stove to 100° F., steam being injected from time to time. The starch is then removed by steeping in a water to which 6 lb. 9 oz. malt have been added. After a day the cotton is rinsed and taken through weak vitriol sours, and then through a soda buth at 3° to 4° Tw. A blue black is thus obtained, which may be turned more to a blue by decreasing the muriate of aniline, chlorate of potash and chloride of copper by one-third.—*C.*

Aniline Blue with Manganese Mordant.—Boil yarn with soap and soda; take through a weak solution of permanganate; lift and wring. It has then a pale brown color. Steep in a solution of tin crystals at 11° Tw. till it is perfectly white. Wash and pass into a sumac water, 1 lb. sumac to 10 lb. yarn. Make up a water with ½ lb. alum, ¾ lb. soda, and 6 drm. (avoirdupois) soluble aniline blue. Heat to 122° F.; enter yarns, give five turns, add 1½ lb. alum and 1½ oz. of the blue; enter yarn again, give eight turns, rinse and dry.—*C.*

Topped Blue on Cotton and Linen Yarns (11 lb.).—1. Give a light blue in the vat, sour, rinse, and add to a cold water 1 oz. tin crystals and 3 lb. 6 oz. nitrate of iron. Work for two hours, take out, make up a fresh cold beck with 2¾ to 3¼ lb. logwood and 17 oz. alum; dye cold in this for a quarter of an hour, and rinse. If the color is not to smear, take through a lukewarm decoction of 4½ oz. glue, and dry.

2. Vat as before, and make up a beck with so-called indigo substitute (a mixture of indulin and extract of logwood), enter the yarn, work for thirty minutes at 144° F., and sadden in a fresh beck with 1½ oz. chromate of potash and ¾ oz. bluestone. This is a very dark shade.

3. Vat as before, and work for an hour in a beck of 11 lb. logwood and 17¼ oz. alum. Make up a fresh cold beck with 2 lb. 3 oz. copperas. Give ten turns in this, and according to shade give two or three dips in both becks. If not deep enough, add a little nitrate of iron to the logwood beck. Rinse, and take through glue. —*R.*

Prussian Blue.—7 pieces, 84 lb. Work in jigger, containing 15 gal. cold water; 5 qt. nitrate of iron, 84° Twaddell; 1 pt. protochloride of tin at 128° Twaddell; give four ends, afterward wash in cold water, and recharge jigger with 15 gal. water, in which is dissolved 5 lb. yellow prussiate of potash and 1 gill sulphuric acid, at 170° Twaddell. Give four ends, wash and dry. —*C.*

Aniline Blue.—7 pieces, 84 lb. Work in stannate of soda at 4° Twaddell, four ends, then in sulphuric acid, 1° Twaddell, four ends, and afterward four ends in water, then recharge jigger with 8 oz. cotton aniline blue and 8 oz. alum in 12 gal. water, 5 to 6 ends, wash and dry.—*C.*

Navy Blue.—7 pieces, 84 lb. Work in jigger charged with 10 lb. sumac, 10 lb. ground logwood, 15 gal. boiling water; give four ends, then recharge jigger with 4 qt. nitrate of iron, at 84° Twaddell, and 9 gal. cold water, in which give four ends, and afterward wash, then recharge with 15 gal. water, 4 lb. yellow prussiate of potash, and ½ gill sulphuric acid, at 170° Twaddell, give four ends and wash in cold water, recharge with 15 gal. water, cold, and 6 oz. BB violet crystals (coal tar), give five ends in this and dry.

China Blue (50 lb. yarn).—Dissolve 4 lb. alum and 6½ oz. China blue (Berlin Anilin Aktien Gesellschaft). Enter yarn 120° F., turn briskly, raise to 150° F., and work to shade. Or prepare with tannin, and then dye as above, without the alum.—*C.*

Another Blue (50 lb. yarn).—Dissolve 3 lb. alum, 1½ lb. carbonate of soda, 4 oz. tartaric acid, and 6 oz. "cotton blue 4½" (Baden aniline). Enter yarn 120° F., raise heat to 140° F., turning continually to shade.—*C.*

Bright Brown (22 lb.).—1. Dissolve in water, catechu, 8¾ oz.; bluestone, 1½ oz. Enter, steep for an hour, wring, and make up a fresh boiling water with bichromate of potash 8¾ oz. Enter for a quarter of an hour, give several turns, and wring. Make up another water with the decoction of sumac, 6½ lb.; curd soap, 10¼ oz.; and work into it oil, 3½ oz. Stir up, enter, give seven turns, add 3½ oz. salt of tin, stir up; re-enter, give seven more turns, wring, and prepare a fresh cold water containing a little Bismarck brown, and dye to shade.

2. For a darker shade use catechu, 4 lb. 6 oz.; bluestone, 7 oz.; and for the chrome bath, 17½ oz. bichromate of potash.—*C.*

Mode Brown, a Yellowish Cinnamon (11 lb.)—Enter in a water at 122° F. with 2 lb. 3 oz. pale catechu. Six turns, and enter in a weak bath of chromate of potash at 88° F. Re-enter in the first beck to which ¾ oz. tin crystals have been added.—*C.*

Solid Brown (22 lb.)—Boil in water, 2 lb. 3 oz. catechu; let settle and dissolve in the clear solution 7 oz. bluestone. Enter at 212° F., work for an hour; wring, and make up a fresh boiling water with 5¼ oz. bichromate of potash. Work in this for half an hour, and rinse. Boil in water 3¾ lb. sumac, work for fifteen minutes at 190° F., lift, and add 5¼ oz. tin crystals. Enter again, work for a quarter of an hour, and wring. Pass in a fresh water, with garnet magenta, 3½ oz.; alum, 3½ oz. Work for half an hour at 100° F.—*C.*

Brown on Cotton Wool (110 lb.)—Dissolve 32¼ lb. catechu in boiling water; add 8¾ lb. bluestone; boil the cotton for two hours in the solution; lift, drain, and enter in a fresh boiling water with 8¾ lb. chromate of potash; work for an hour, drain in the centrifugal, rinse, drain again in the centrifugal, and dry. —*C.*

Brown on Sewing Cotton (20 lb.).—Give four or five turns in catechu at 3° Tw., and rinse in chrome or clear lime water. Wash in clean water, and run into fustic liquor. Sadden with 3 pails fustic liquor, 2 pails redwood liquor, and 1 pail logwood liquor; four turns. Now add 1 gal. alum liquor at 8° Tw., give four or five turns; wring out, and dry.—*C.*

Light Brown on Sewing Cotton (20 lb.).—Run through catechu liquor at 3° Tw., raise with chrome in a fresh water; wash, and run into fustic liquor, to which is added 1 qt. solution of bluestone. If not rich enough, top with Bismarck brown to shade.—*C.*

Hair Brown, Light Blonde (60 lb.). - Boil 6 lb. cutch and 6 oz. bluestone till dissolved. Add to a hot water, and give three turns; put down all night; one turn in the same liquor in the morning, and wring out. Dissolve 1 lb. alum in a hot water; enter, give three turns, and lift. Boil ½ lb. turmeric and ½ lb. logwood extract together; add this to the alum water; give four turns, wash in a cold water and dry. —*C.*

Hair Brown; Dark Blonde (60 lb.).—Prepare with cutch and bluestone as above. Then dissolve 6 oz. chrome; add to a hot water; four turns with yarns. Let off. Add to a warm water 1 lb. alum; three turns, and wring. Boil 2 lb. fustic extract and 2 oz. logwood extract together, and add to a warm water. Four turns, lift, and add 2 qt. of dissolved copperas; three turns, wash in cold water, and dry.—*C.*

Light Red Brown (60 lb.).—Boil 12 lb. cutch with 12 oz. bluestone till dissolved. Add this to a hot water, give three turns, put down all night; give one turn in morning, and wring out. Dissolve 12 oz. chrome, add this to a hot water, give the yarns four turns and run off. Dissolve 1 lb. alum in a hot water, give three turns more and wring; boil 1½ lb. extract of fustic and 4 oz. extract of logwood together, add this to a hot water, four turns and lift; add 1 qt. of copperas water, give three turns more, wash in cold water and dry.—*C.*

Dark Medium Brown (60 lb.).—Boil 12 lb. cutch and 1½ lb. bluestone till dissolved; add this to a hot water, give three turns with yarns, and

put down all night; give one turn in morning and wring up. Dissolve 1 lb. chrome, add it to a hot water, give three turns and let off; dissolve 1 lb. alum, add it to a hot water; give three turns and wring out. Boil 2 lb. fustic extract and ½ lb. logwood extract together, add these to a hot water, four turns and lift; add 3 qt. of copperas water, three turns more, wash in cold water and dry.—*C.*

Dark Brown on Cotton.—For 100 lb. cotton. Mordant at the boil with catechu, 10 lb.; logwood extract, 2 lb.; magenta, ¼ lb., for three hours, then darken in a new bath with bichromate of potash, 3 lb.; soda, 2 lb.

Very Dark Brown (60 lb.).—Boil 18 lb. of sumac, put down in this all night, take through 2 gal. black liquor in a cold water, wash off in two waters and wring up; boil 3 lb. cutch and 1 lb. bluestone, add the solution to a hot water, give four turns and lift; dissolve 1½ lb. chrome, add to a hot water, give four turns. Go through the chrome and cutch three times each, and finally sadden with 2 qt. copperas water. Wash in cold water and dry.—*C.*

Cinnamon Brown (10 lb.) Cloth or Yarn.—Take through catechu liquor at 4° Tw., or, in case of piece goods, run three or four times backward and forward in a jigger. The temperature of the bath is about 180° F. Then pass into a solution of chrome (bichromate of potash) at 1½° Tw., and wash. Make up a tub (or, in case of pieces, a jigger) with about 30 gal. fustic liquor, 6 gal. redwood liquor and ¼ lb. annatto, previously dissolved in the usual manner. Give three turns, lift, add 4 qt. alum liquor at 8° Tw.; give three or four turns more, lift and finish.—*C.*

Madder Brown on Cotton Cloth (600 yd.)—Pad the cloth in 6 gal. red liquor and 1 gal. black liquor, with an equal quantity of water. Dry in the machine or padding stove; let age for twenty-four hours; run through boiling chalk water, and bring into a water at 170° F., with 40 lb. bark and 20 lb. madder, and work for an hour; wash, and finish. For darker shades, the cloth must be first prepared with sumac or myrobolans.—*C.*

Medium Brown on Cords or Beavers (70 to 80 lb.)—Run through cutch liquor at 2½° Tw. and 180° F., four times in a jigger; chrome in warm water, and run into two fustic liquors of 20 pails each; add to the second fustic liquor 1 qt. annatto liquor. Then work well in a tub, with 5 pails sumac liquor, 3 pails redwood liquor, 2 pails logwood liquor, and 10 pails fustic liquor. Then run into a warm water, with 4 qt. of copperas liquor at 8° Tw.; work well, in two waters, and run again into two fustic liquors, to the second of which 1 qt. annatto liquor is added, and top with Bismarck brown to shade.—*C.*

Light Browns on Cords.—Run through a jigger with cutch at 2° Tw. at 160° F.; take through a warm chrome water; wash in two waters, and run into two fustic liquors 20 pails each, to the second of which 1 pt. annatto is added. Then work in 2 pails sumac, 2 pails redwood liquor, 1 pail logwood liquor, and 15 pails fustic liquor. Run into a warm water with 2 qt. copperas liquor at 8° Tw. Wash in warm water, and run into 20 pails fustic liquor, with 1 pt. annatto liquor, and top with Bismarck brown as required.—*C.*

Common Brown (100 lb.)—Boil 20 lb. catechu in water, dissolve in the liquid 10 lb. alum, let settle, enter yarn in hot liquid; and, after working well, take out, and enter into a fresh boiling water, with 4 lb. yellow chromate of potash. Rinse and soften with oil and soap.—*C.*

Brown; Bismarck Brown.—For 10 lb. of cloth or yarn, work in a hot decoction of ½ lb. of sumac for ½ hour; wring out and work for 20 minutes in a solution consisting of 4½ oz. of stannate of sodium, and then thoroughly wash from this. Dissolve 4 oz. of Bismarck brown in the dye beck or boiler, and work the goods in this for ¼ hour, at 120° F. (48·8 C.), or at a heat about as hot as the hand can bear; then wring out to dry. If a redder shade than this preparation will yield be desired, a little red liquor must be added to the dye; if a yellower tint be required, this may be got by the addition of a little fustic.—*G.*

Dark Brown.—7 pieces, 84 lb. Work in jigger, charged with 12 gal. boiling water, and 20 lb. catechu, 5 lb. sumac (Palermo), and 3 lb. sulphate of copper; give in this 5 ends, then recharge with 1 gal. acetate of iron, at 12° Tw., and 5 lb. sulphate of iron cold, and 12 gal. water cold. Give 4 ends, and afterward wash again, and recharge jigger with 12 gal. water, boiling, and 3 lb. bichromate of potash; give 4 ends, then wash and dry.

Medium and Light Brown can be obtained by decreasing the quantities of ingredients.—*G.*

Dark Nacarat (10 lb.).—Boil 2 lb. catechu in water; dissolve in the solution 5 lb. bluestone and work the yarn at a boil. Leave them in the liquid overnight; lift the next morning, and take through a boiling water, with ½ lb. chromate of patash. Take out and steep for half an hour in a solution of tin at 3° Tw. Lift and top at a hand heat with the decoction of 2 or 3 lb. logwood. Work in this for an hour; lift, add 1½ oz. tin crystals, re-enter, work, wring, and dry.—*C.*

Fast and Bright Brown (10 lb.).—Boil in water 2 lb. best Pegu cutch; dissolve in the liquid 3 oz. bluestone, and make up with water to 14 gal. Let settle, heat the clear to a boil, enter the yarn, and let steep for two hours. Lift, enter in a fresh boiling water with ½ lb. bichrome. Give six turns, lift, and rinse in cold water. If a finer shade is desired, it may be entered in a water at 100° F., with ½ lb. alum, 1 oz. tin crystals and a little magenta.—*C.*

Noisette, Six Shades (11 lb.).—1. Make up 87 pt. water at 68° F., with ¼ lb. sumac and 1¼ oz. prepared catechu. Enter the yarn, steep for an hour, lift, and add 2¼ oz. nitrate of iron; six turns, and wring well out. Make up a fresh water at 86° F., with ½ oz. chromate of patash; six turns, and take through warm water.—*C.*

2. Make up the first beck with 8¾ oz. of sumac and 2¼ oz. prepared catechu. Steep for an hour, lift, and add 3½ oz. nitrate of iron; re-enter, six turns, and enter in a water at 86° F., with 1 oz. chromate of potash.—*C.*

3. The first water is at 86° F., and contains the decoction of 13 oz. sumac, 4 oz. logwood, and 3½ oz. prepared catechu. Steep for an hour. Add 3½ oz. nitrate of iron, give ten turns, and take through a fresh beck of 1¾ oz. chromate of potash.—*C.*

4. The first water is made up with 17 oz. sumac, 8¾ oz. logwood, and 4½ oz. prepared catechu. Steep for an hour. Add 4½ oz. nitrate of iron, and give ten turns and pass through a fresh beck of 2¼ oz. chromate of potash at 86° F.—*C.*

5. The first water is made up with 26 oz. sumac, 17 oz. logwood, and 7 oz. prepared catechu. Steep for an hour; add 6¼ oz. nitrate of iron and give ten turns. Take through a beck of 3½ oz. chromate of potash.—*C.*

6. 2 lb. 3 oz. sumac, and the same weight of logwood for the first beck. Use 9½ oz. nitrate of iron, and take through 6¼ oz. chromate of potash.—*C.*

Buff on Cotton Yarn (31 lb.)—Annatto, 2 oz.; soda ash, 4 oz. Dissolve in water at a hand heat. Give the yarns five turns and wring. Enter in a fresh lukewarm water, slightly soured with vitriol. Five turns. Wash.

Light Buff (60 lb.)—Bleach, add to a cold water 3 pt. nitrate of iron; work yarns five times and wring. Add clear lime water to a fresh cold water, give five turns and wring, re-enter in the iron liquor, five turns, wash off and dry.—*C.*

Another Light Buff (60 lb.).—Bleach, work yarn five times in dilute clear lime water and wring; boil 2 oz. Bismarck brown (Brooke, Simpson & Co.), and add to a cold water. Work five turns, wash in cold water and dry.—*C.*

Dark Buff (60 lb.).—Boil 6 lb. turmeric with 3 lb. alum in 6 gal. water, and add this to a hot water. Work yarns five times and lift, add 3 pt. nitrate of iron, three turns more, wash in cold water and dry.—*C.*

Another Buff (11 lb.).—Boil 1 oz. to 1⅜ oz. annatto in the solution of 2½ oz. soda ash, and work the yarn for an hour at a boil. Lift, and top in a fresh water with magenta and a little alum.—*C.*

Canary—5 pieces=80 lb. cloth—Jigger charged with 12 gal. cold water, 2 pt. fustic extract at 48° Twaddell, give 1 end, then add 1½ pt. fustic extract at 48° Twaddell, give 4 ends, and recharge jigger with the same quantity of water, and 3 lb. of alum, give 4 ends, and afterward 2 in water, and then the goods are ready.—*G.*

Chamois 5 pieces=80 lb. cloth.—12 gal. water at 100° F.; jigger charged with 3 pt. catechu 4° Tw., give 1 end, then add 2 pt. catechu at 4° Tw., give 4 ends more, recharge jigger with same water and 3 qt. bichromate potash (1 lb. per gal.), give 1 end, then add 2 qt. more bichromate potash (1 lb. per gallon), give 4 ends, wash.—*G.*

Chocolate (11 lb.)—Work for half an hour at 167° F. in a water of 8¾ oz. prepared catechu, lift, and pass five to seven times through a fresh water at the same heat made up with 1¼ oz. chromate of potash. Lift, and top in a fresh water with about ⅛ oz. magenta and 15 gr. extract indigo.—*C.*

Claret (11 lb.).—Make up a water with 17 oz. prepared catechu, and work the yarns for an hour. Wring and steep for half an hour in a hot water with 6¼ oz. chromate of potash, take through cold water and work for half an hour in a water at 190° F, with 3¼ lb. sumac. Dye in a cold water with 1¾ oz. magenta, lift, and add to the water 8¾ oz. alum and the decoction of 2¼ lb. logwood. Enter again, work, lift, and add from ⅛ to 1¾ oz. chromate of potash, reenter and work.—*C.*

Claret (72 lb. cloth).—Jigger charged with 12 gal. of hot water at 120° F. (49° C.), and 10 lb. sumac, and 10 lb. ground logwood, give 5 ends in this, then add to it 5 gills protochloride of tin at 120° Tw., give 4 ends more and wash, recharge jigger with 12 gal. hot water 120° F., 10 lb. ground logwood, and 5 lb. peachwood, give 4 ends in this, and afterward add to same charge 8 oz. ground alum, dissolve, and give 2 more ends, wash as usual.—*G.*

Cream Color (11 lb.)—Boil out ¾ oz. prepared catechu in water, and dissolve 2 lb. 3 oz. curd soap in the clear liquid. Enter the cotton at 190° F., and work for an hour.—*C.*

Dove on Velvets.—Run through 60 gal. water, to which 10 gal. logwood liquor and 5 gal. sumac have been added. Lift, add 3 qt. copperas liquor at 8° Tw., enter, run through again, wash, and finish.—*C.*

Light Drab on Cotton (60 lb. cotton yarn).—Boil 3 lb. sumac, 1 lb. logwood chips, 1 lb. fustic. Enter the yarn at 120° F., give five turns, wring, add 4 oz. copperas, give five turns at the same temperature, take out and add 4 oz. nitrate of iron, ½ bucket fustic liquor, give five turns and wash out in water. Second bath, 2 lb. soap at 110° F., give five turns and wring.

Light Drab (60 lb.).—Boil 6 oz. redwood extract till dissolved. Add the liquor to a warm water, work five turns, lift and add 1½ pt. black liquor. Three turns more, wash and dry.

Medium Drab (60 lb.).—Increase the peachwood extract to 1 lb., and work as above.—*C.*

Dark Drab (60 lb.).—Boil 6 lb. cutch until dissolved (without any bluestone), add to a hot water, five turns, run off and wring. Dissolve 1½ lb. peachwood extract, add to a warm water, five turns, lift and add 1 qt. black liquor, three more turns, wash and dry. For a yellower shade, boil a little extract of fustic along with the peachwood; for a redder shade add a little alum along with the peachwood, and for a browner tone top with a little Bismarck brown.—*C.*

Drab on Velvets.—Run four or five times through a bath made up of 60 gal. fustic liquor, 20 gal. sumac liquor and 1 pt. of dissolved annatto. Lift, add 4 qt. of copperas liquor at 8° Tw. Run four or five times through, wash and finish.—*C.*

Light Drab on Cords.—Work with 1 pail sumac, 2 pails fustic, 4 qt. logwood and 1½ pt. annatto, filling the tub up with warm water. Run into a warm water with 3 pt. copperas liquor at 8° Tw., and wash off in warm water.—*C.*

Drab (100 lb. yarn).—Dissolve 8 lb. alum and ¼ lb. nigrosine (F. Beyer & Co., of Elberfeld). Enter at 120° F. and turn constantly to shade whilst raising the heat.—*C.*

Fawn on Velvets.—Make up a catechu bath at 2° Tw. and 180° F., run through this, pass into chrome bath at 1° Tw., wash and sadden with 60 gal. fustic and 30 gal. sumac. Lift, add 4 qt. copperas at 8° Tw., run through again, wash and finish.—*C.*

Gray on Cotton Yarn (31 lb.).—Boil out 30 oz. fustic. Enter the yarn at a hand heat, and let soak for fifteen minutes; sadden with the same weight of copperas, wash well and wring. Enter in a cold water with 60 oz. alum and dye up to shade with a little induline.—*Williams Bros. & Ekin.*

Prussiate Green (22 lb.).—Dissolve 2 lb. 3 oz. alum in lukewarm water and give two turns. Dissolve in fresh water 17½ oz. solid extract of bark. Work for an hour and wring three times. Prepare two cold waters, the first with 7 oz. nitrate of iron slightly soured with sulphuric acid, and the second with 3½ oz. yellow prussiate. Give five turns in each, lift and wring. Before taking out of the second add 2 oz. muriatic acid, rinse, wring and dry.

For heavy greens take extract of bark, 2 lb. 3 oz.; nitrate of iron, 12 oz.; yellow prussiate, 7 oz.—*C.*

Grass Green (55 lb.).—Steep the cotton, previously boiled, for a night in water with 8¾ oz. alum. Next morning rinse, wring and enter in a water at 140° F., containing 13 lb. 2 oz. bark. Work for forty-five minutes, wring and dye to shade in a water containing 4 lb. 6 oz. soda crystals and Nicholson blue (BBB) 8¾ oz. The color, of course dissolved, should be added in two portions to prevent unevenness. Work for half an hour, lift and add to the beck the solution of 3¼ lb. alum. Six more turns, rinse, wring and dry.—*C.*

Cœruleine Green.—Mordant with chrome alum, or take the yarn alternately through chromate of potash and bisulphite of soda. For the dye beck stir up the cœruleine with twice its weight bisulphite of soda at 71½, and let the mixture stand for some hours before adding it to the dye beck.—*C.*

Methyl Green (22 lb.).—Dissolve 17¼ oz. tannin in water, enter the cotton at 167° F., and steep for fifteen minutes, giving several turns. Wring, and add to a fresh cold water the solution of 3½ oz. methyl green, enter yarns, give twelve turns, wring and dry.—*C.* Or (for 11 lb.), dissolve 3,100 grains tannin in a boiling water, enter the bleached cotton overnight in the hot solution, wring out and dye in cold water with a solution of the color according to shade. Wring, and dry in the dark without washing.—*C.*

Emerald Green on Cotton Velvets.—Give a yellow ground with fustic liquor. Work well, lift, and add 4 qt. solution of alum at 10° Tw. Work well, and wash in two clear waters. Repeat the same operation and fold the pieces up. When dry, blue the pieces in the vat to the shade required.—*C.*

Light Bluish Green (11 lb.).—Extract 17 oz. turmeric at a boil, and add to a water. Steep for two hours, lift, add 1¾ to 2½ oz. sulphuric acid, re-enter five times, take out, wash well, and dye a Prussian blue in the following: *a.* 3 oz. tin crystals, 8¾ oz. nitrate of iron. *b.* 4½ oz. yellow prussiate, 2½ oz. sulphuric acid. If

the blue is required darker, repeat the operation.—*C.*

Night Green for Cotton Velvets, Velveteens, etc.—Boil 3 lb. nut-galls in 4 gal water, let settle, draw off the clear and dilute it with 20 gal. water. Bring this liquor into a jigger at about 150 F., enter the piece and run it through six times, add a pint of double muriate of tin and run through again. Wash and run through a bath prepared with 20 gal. of water, to which 4 gal. fustic liquor have been added. Run through six times, add to the fustic 4 qt. alum liquor at 8° Tw. Run through several times more, lift and drain in a centrifugal. Make up a jigger with 20 gal. water and ½ lb. of night green paste, previously dissolved; when all the color has been taken up, take up and finish. (Methyl green, Helvetia green, or Malachite green, according to shade, will now be substituted for the night green paste.—*C.*

Russian Green for Cotton Yarn.—After having been well boiled the yarn is brought into a boiling bath of 20 lb. sumac and 1 pound logwood extract, left in this overnight and placed into a cold bath containing 4 lb. copperas and 6 oz. Cyprus vitriol, turned for an hour, taken out and placed again into the first bath, turned about ten times and dyed in fresh tepid water, containing ¾ lb. methyl green, and shaded in the same bath, according to wants, with decoction of fustic and logwood.

Chrome Orange on Cotton Carpet Yarn (100 lb. of yarn).—16 lb. of brown sugar of lead, 8 lb. of litharge, 8 lb. of chrome, 5 lb. of lime.

1 Bath.—Dissolve the lead and litharge, enter the yarn, which must be previously boiled out, give five turns, wring out.

2 Bath.—Dissolve chrome, enter yarn warm, give the necessary turns, from three to five, wash off and wring.

3 Bath.—Slake the lime, enter the yarn boiling hot, and turn to finish, wash off and wring ready for the drying room.

Note 1.—For finer yarns, white sugar of lead will work a cleaner or brighter color, but not as heavy a body. 2. If the color should not be red enough in liming, throw up and add more lime.

Blue Green on Cords, Beavers, and Beaverteens.—Boil the goods in soda ash for an hour, and leave folded up in clear water to drain. Give a good ground in the vat, sour, wash well in two or three waters, and sadden in logwood liquor, 50 gal., and fustic liquor, 30 gal. Add copperas water, 2 qt., and bluestone liquor, 2 qt., and run through again. Wash in two waters and run the pieces into fustic liquor, 70 gal. Drain, add bluestone water, 3 qt., at 8° Tw., run through and wash. Give five turns in each operation. This is a bluish olive.—*C.*

Chrome Green on Cloth or Yarn.—Give a vat blue ground, run through, sour, and wash in clean water. Run through sugar of lead at 6° Tw., then through caustic soda at 2°—3° Tw., wash off, and run through bichromate of potash at 2° Tw.

Cloth requires three or four turns, yarn five or six turns.

Green on Yarn (100 lb.).—Dissolve nitrate of iron, 10 lb.; tin crystals, 1 lb. Work through the cold solution, give five turns and wring. Dissolve in another water yellow prussiate, 6 lb., give the yarn six turns in the cold solution, wring, and pass back to the nitrate of iron, and thence return to the prussiate bath, to which alum, 2 lb., have been added, give three dips in each, and rinse.

Boil bark, 40 lb., for an hour, strain the decoction into a tub, add sugar of lead, 1 lb., well dissolved, and when all is mixed, enter the yarn at 180° F., and turn it for half an hour, wring, and take it through another water, containing alum, 2 lb.; indigo paste, 2 lb. Rinse and dry.—*C.*

Cheap Green.—Prepare yarns overnight in a decoction of sumac. Boil fustic, 25 lb., for one hour in a bag. Add to the liquid verdigris, 2½ lb., dissolved in acetic acid and hot water. Cool the dye and enter the yarns, turn well, and heat up to a boil. Keep the yarn half an hour in the bath, let it cool, and enter it in another water containing the decoction of 10 lb. logwood, heat to a boil, and keep it there for half an hour; lift and rinse.

By using bluestone instead of verdigris an olive green shade is produced.—*C.*

Gray (31 lb.).—Extract fustic, 30 oz., at a boil. Enter the yarns at a hand heat, and steep for fifteen minutes. Sadden with copperas, 30 oz. Wash well and wring, enter in a cold water with alum, 60 oz., and dye up to shade with a little induline. (Williams Brothers and Ekin.)—*C.*

Mode Gray on Cotton Wool (22 lb.).—Enter in water with the extract of 11 lb. logwood, work for half an hour in the cold, lift, and add copperas, 4½ lb. 6 oz. Re-enter and work to shade; lift, rinse, and dry.—*C.*

Slate Gray on Cotton Wool (22 lb.).—Make a decoction of sumac, 2 lb. 3 oz.; catechu, 17½ oz. Enter the cotton at 122° F., and let steep for an hour, turning from time to time. Lift, and add to the water 8¾ oz. nitrate of iron, re-enter and work till the color is level. Lift, wring, and add to a fresh water bichromate of potash, 6¾ oz. Heat to 140° F., enter the cotton, give seven turns, let steep till cold, and dry.—*C.*

Silver Gray (55 lb.).—Six turns in a decoction of gall-nuts, 13 oz., wring, and pass into a cold water with copperas, 3 lb. 4½ oz., and bluestone, 1 lb. 10 oz. Seven turns, rinse, and dry.—*C.*

Mode Gray (55 lb.).—Boil in a water, 3¼ lb. catechu; dry extract logwood, 17 oz.; and dissolve copperas, 8¾ oz., and bluestone, 8¾ oz. Enter yarns at 122° F., and work for half an hour.—*C.*

Light Gray on Cotton Pieces (60 lb.).—Boil solid extract of logwood, 1½ lb., and solid extract of bark, ½ lb., in water. Run the pieces six to eight times through, squeeze, and run through a fresh beck of water with copperas, 5 lb. Rinse, and finish with the dressing directed for pansy.—*C.*

Medium Gray (60 lb.).—Increase the extract of logwood to 2½ lb. and the bark to ¾ lb., and use 10 lb. copperas.—*C.*

Dark Gray (60 lb.).—Extract logwood, 4 lb., and extract of bark, 1½ lb. Add to the finishing mixture logwood and copperas enough to color it slightly. If a yellow tone is required add more bark liquor, and for a reddish shade take a little sapan liquor.—*C.*

Stone Gray (25 lb.).—Boil sumac, 25 lb., and fustic, 1 lb. Enter, give five turns, wring, and enter in a cold water with copperas, 1 lb., and bluestone, ¾ lb. Five turns, rinse, and dry.

Cotton Dyeing.—Fast Gray (22 lb.).—Mix 1¾ pt. olive oil and the solution of 2 lb. 3 oz. soda crystals. Work the cotton in this mixture at a boil for thirty minutes, wring and dry. Then powder 44 lb. coal very fine, add 15¼ lb. soda crystals and 17½ pt. boiling water. Let the mixture steep for some hours and then boil for half an hour in 227 pt. of water; strain and work in the hot liquid for a quarter of an hour and wring well. Repeat this process five times, wringing each time. Wash in lukewarm water, then in cold water, wring and dry. Pass into weak size, to which a little emulsive oil has been added, wring and dry. This gray resists soap, acids and chloride of lime, but it is not beautiful.—*C.*

Mode Gray (11 lb.).—Work for two hours with the decoction of 35 oz. sumac and 4½ oz. fustic. Lift and dye in a fresh water with 4½ oz. copperas. Top in fresh water with gentiana, blue or methyl violet.—*C.*

Maroon on Cotton (75 lb. yarn).—Steep overnight in decoction of 18 lb. sumac, wring and enter cold in a bath of oxymuriate of antimony, 2° Tw., work for four hours, wash,

wring and enter dye bath of 4 pails redwood liquor and 9 oz. "garnet" (Farbwerke, Hoechst am Main) at 120° F. and raise to 160° F., turning constantly.—*C.*

Deep Olive (11 lb.).—Boil in sufficient water 14 oz. sumac, work for an hour in the clear and make up a fresh water with 26 oz. copperas. Work for fifteen minutes, wring and prepare a beck of red liquor at 1½° Tw., raise to 140° F., give ten turns, lift, wring and enter in a fresh water, at 140° F., containing 5½ lb. fustic. Work for an hour and wring. Bark may be used in place of fustic.—*C.*

Light Olive (10 lb.).—Boil 1 lb. bark in water. Boil ½ lb. turmeric in another vessel and mix the decoctions. Dissolve in the liquid 5 oz. alum and 1½ oz. extract of indigo, or more, as the shade may require. Steep the yarn in this liquid at 88° F., and top to shade with a decoction of peachwood.—*C.*

Light Olive (11 lb.).—Boil 3¼ lb. fustic in water, make up a bath with the extract, dissolve in it 17½ oz. alum, enter yarn and steep for an hour. Lift and dissolve in the bath 1¼ oz. extract indigo. Re-enter and work for fifteen minutes.—*C.*

Medium Olive (11 lb.).—Extract 8½ oz. sumac in boiling water, enter the yarn in the clear liquid, let steep and make up a fresh water with 8½ oz. copperas. Enter the yarn (previously wrung out), work for fifteen minutes, wring and enter in a fresh beck of red liquor at 1½° Tw. Give twelve turns at 148° F., wring, make up a fresh water with the decoction of 2 lb. 11 oz. bark and work half an hour.—*C.*

Carmelite Olive.—For 100 lb. bleached cotton, 15 lb. catechu, 4 lb. blue vitriol, 1 lb. bichromate. Work same as for yellow cannelle and finish with 15 lb. quercitron and 1 tumbler of pyrolignite of iron.

Aniline Orange (60 lb.).—Bleach, boil 3 lb. tannic acid, and add this to a warm water. Work yarns five turns, and wring. Spirit with 3 qt. nitro-muriate of tin, and wash in cold water with a little soap in the last water. Dissolve 12 oz. aniline orange, add this to a warm water, wash, and dry.—*C.*

Annatto Orange (60 lb.).—Boil 6 lb. best annatto in 2 lb. soap and 2 lb. common soda till dissolved, and add this to a boiling water. Work yarn five turns, wash in cold water, and dry. This color may be topped with various wares.—*C.*

Full Orange (60 lb.).—Dissolve 12 lb. sugar of lead in 12 gallons of clear lime water, and add the solution to a cold water. Work yarn five turns, and wring. Dissolve 4 lb. bichromate of potash, and add to a cold water. Work five turns and wring, and repeat twice in the old liquor, wringing each time. Heat lime water to a boil, and work yarn five turns quickly. Wash off in warm water with a little soap, and dry.—*C.*

Orange on Cotton Velvets, etc.—Pour 10 gal. boiling water on 4 lb. of turmeric, but do not boil; stir up well, let settle, and run the clear into a jigger; make up with water to 20 gal., and add ½ lb. annatto, which has been boiled with ¼ lb. of pearlash. Run the piece six times through, and add 4 qt. solution of alum at 8° Tw., and ¼ pt. oil of vitriol. Run through several times more, wash, dry, and it is ready for finishing.—*C.*

Cheap Orange (50 lb.).—Dissolve 10 lb. sugar of lead, boil for half an hour with 4 lb. litharge, let settle, and enter the yarns in the solution of basic acetate of lead thus obtained. Give two turns, lift, wring, and take through weak lime water, and then into a warm water containing the solution of 6 lb. bichromate of potash. After fifteen minutes lift and take through boiling lime water very quickly. Rinse and dry.—*C.*

Fine Orange (11 lb.).—1. Boil 2¼ oz. annatto in the decoction of 11 oz. soda crystals, filter, and work in the hot clear liquid for half an hour. Lift and pass through a fresh water at 100° F., with 17 oz. alum, to which a little magenta may be added if a redder tone is required.—*C.*

2. Steep the well bleached yarns overnight, 6¼ oz. tannin. Take out and dye at 144° F. with aniline orange.—*C.*

Rich Orange (72 lb.).—Jigger charged with 12 gal. hot water, 120° F. (49° C.), and 12 oz. soda ash, 4 lb. annatto. Dissolve and add 4 lb. turmeric; give four ends in this, then add to same 8 oz. (fluid) of sulphuric acid at 170 Tw., give two ends in it, and afterward wash. This is much cheaper than chrome orange, and good.

Alizarine Red for Yarns (220 lb.).—Prepare in neutral alizarine oil. Dry the yarns in the stove, and steam for three-quarters of an hour at 1½ atmosphere pressure. Mordant in red liquor at 14° Tw., and wash well. Dye for one and a half hours at 158° F. with the following mixture: Alizarine, at 10%, 44 lb.; acetate of lime, at 53° Tw., 22 lb.; sulpholeic acid, 11 lb. Steam for an hour, and soap as may be needed, with or without the addition of carbonate of soda. A little tin crystals may be added to the red liquor to raise the color.

The selection of alizarines depends on the tone of color aimed at. "Alizarine for reds" used alone gives the most vivid red. If a bluer tone is desired, a little "alizarine for violet" is added.—*C.*

Aniline Scarlet (60 lb.).—Bleach; boil 3 lb. tannic acid, and steep the yarn overnight in the solution. Mordant with permuriate of tin (red cotton spirits). Wash off in two cold waters and wring up. Dissolve 6 oz. aniline scarlet, and add the solution to a warm water. Work the yarn for an hour, giving ten turns; wash in cold water and stove dry.—*C.*

Another Aniline Scarlet (60 lb.).—Bleach and mordant as in the last receipt. Boil 3 lb. turmeric and 3 oz. aniline ponceau, and add the solution to a hot water. Work yarns ten turns, wash in cold water and stove.—*C.*

Common Scarlet (60 lb.).—Bleach; boil 6 lb. sumac, and add this to a hot water. Work the yarns five turns, and wring; mordant in tin, as in the preceding receipts. Wash in two cold waters, and wring up. Boil 18 lb. peachwood and the same weight of fustic ground, and add the decoction to a hot water. Work the yarns ten turns, and raise with 1 lb. alum. Wash in cold water and stove. For lighter shades the sumac may be omitted and turmeric used in place of fustic.—*C.*

Scarlet on Cotton (22 lb.).—Dissolve in hot water separately 8¾ oz. good glue and 17½ oz. curd soap. Mix. Enter the yarns, work well for half an hour and wring out. Then enter the yarns in tin composition at 6¾° Tw., work well for half an hour and wring. Enter into red liquor at 6¾° Tw., work for two hours and wring. Then dye at a hand heat in a water to which dissolved aniline scarlet is gradually added. As soon as the shade is reacted the heat is raised a little, and the yarn is then let gradually cool in the liot. The red liquor used in this process is prepared by dissolving 10 lb. alum and 10 lb sugar of lead, each separately, mixing the solutions, letting settle, decanting off the clear liquid, and adding to it the solution of 2 lb. soda crystals.

Saffranine Scarlet (60 lb.).—Bleach; boil 2 lb. annatto with 1 lb. soap and 1 lb. soda until well dissolved and add to a boiling water. Work ten turns, wash in two cold waters, and wring up. Mordant in red liquor, wash off in two waters, and wring. Add to a beck of warm water 2 lb. of saffranine. Work yarns in this for one hour, giving ten turns. Wash in cold water, and stove.—*C.*

Saffranine Scarlet (60 lb.).—1. Soak yarn for twelve hours in hot water, wring and soak for an hour in the warm decoction of 20 lb. sumac. Lift and pass through nitro-muriate of tin at 2½° Tw. Rinse three times, and wring. Extract 2 lb. turmeric in a little water, add a boil; add the decoction to a cold water, and add further 19¾ oz. saffranine, previously dissolved in

3½ pt. of boiling water, and filtered. Enter the yarn, and gradually raise the heat to 131° F., turning well for half an hour.—*C.*

2. Take the bleached goods through stannate of soda at 2½° Tw., and leave for an hour; take through vitriol sours at ½° Tw., and wash. Dye with aniline scarlet. Pass through a water with tartar emetic, drain in the centrifugal, and top in a fresh water with saffranine. Afterward pad in a 10 per cent. solution of alizarine oil, dry and steam.—*C.*

Peachwood Scarlet (55 lb.).—Boil together for twenty minutes 11 lb. sumac and 5½ lb. turmeric. Steep the yarn overnight in the clear liquid; lift, and give five turns in tin solution at 2½° Tw. Give five turns in a water with 13 lb. peachwood, and let steep for two hours. Lift, and let steep three or four hours in a fresh water with 26 lb. peachwood and 5 lb. 7½ oz. alum. The tin solution is prepared as follows: Muriatic acid, 3 parts; nitric acid, 1 part. To every 2 lb. 3 oz. of this mixed acid take 4¾ oz. tin crystals. The second peachwood beck may be saved and used for the first peachwood steep of the next lot.—*C.*

Safflower Scarlet (60 lb.). — Bleach; boil till quite dissolved 3 lb. concentrated annatto with 1 lb. soap, 1 lb. soda crystals, and add this to a beck of boiling water. Work yarns one hour, ten turns. Wash in two cold waters and wring. Add to a water one bottle carthamine (extract of safflower), work yarns four turns and lift; add 3 pt. acetic acid; re-enter, work till all the color is taken up. Wash off in three cold waters, to the last of which 1 lb. cream of tartar is added. Wring and dry cold.—*C.*

Another Scarlet (100 lb.).—Steep overnight in the decoction of 20 lb. sumac. Work for fifteen to twenty-five minutes in a beck of oxymuriate of antimony at 2° Tw., wash well, and dye to shade with ponceau 2 B (Berlin Aktien Gesellschaft) 1¼ lb. Enter a t70° F., and raise heat not above 90° F.—*C.*

Another Scarlet (50 lb.).—Steep overnight in the decoction of 18 lb. sumac, wring, and enter cold in a bath of oxymuriate of antimony at 2° Tw. Give three or four turns, and let steep for half to three-quarters of an hour. Wash, and dye up with saffranine, 10 oz.; phosphine, 4 oz. (Berlin Aktien Gesellschaft). Enter at 60°, and turn rapidly, raising the temperature to (but not above) 110° F.—*C.*

Ponceau and Scarlet with Saffranine on Cotton (11 lb.).—Prepare a boiling beck with ½ kilo. turmeric, and work the goods in it for an hour. Take through a beck of 17¼ oz. sulphuric acid, lift and prepare for three hours at a boil with 2¼ lb. sumac. Take out and dry in a fresh beck at hand heat with clear solution of saffranine.

Ponceau 3 R. Berlin Aktien Gesellschaft.—Soap and dry; mordant for an hour in red liquor at 17° Tw., free from lead. Wring and dye in a fresh water to which the dissolved color is added. Heat slowly to a boil, and let the cotton cool in the bath. The red liquor is prepared as follows: 8 parts sulphate of alumina, 14 water, 7 soda crystals, 10 parts sugar of lead and 7 water. Each of these liquids is boiled separately, and when cooled down to a hand heat they are mixed; the mixture is stirred, let settle, and filtered. This process may be used for fixing any of the ponceaux and the Bordeaux of the same company upon cotton.—*C.*

Claret on Cotton Yarns (11 lb.).—Make up a beck with 17¼ oz. prepared catechu, and work the prepared yarn in it for one hour. Wring and steep for half an hour in a hot beck of 6¼ oz. chromate of potash; take through cold water, and work for thirty minutes in a beck of 3¼ lb sumac at 190° F. Then dye in a cold beck with 1¾ oz. magenta, take out, add to the beck 8¾ oz. alum and the decoction of 2¼ lb. logwood. Enter again, work in the cold beck; lift and add according to shade from ⅛ to 1¾ oz. chromate of potash, re-enter and work. The color is now complete.—*R.*

Saffranine Pink (60 lb.).—Bleach and mordant in red liquor. Wash well from this in two or three cold waters, and wring. Add to a warm water 1 lb. saffranine paste; work five turns, wash off in cold water, and stove.—*C.*

Safflower Pink (60 lb.).—Bleach and add three gills of extract safflower (carthamine) to a water. Work yarns for six hours, giving them a turn every half hour, and keep them in the liquid till all the coloring matter is taken up; add toward the close a little acetic acid to raise the shade. Wash off in three waters, adding to the last 1 lb. of cream of tartar, and dry cold.—*C.*

Safflower Pink.—7 pcs., 84 lb.; worked in jigger with 20 gallons of water at blood heat, and 9 oz. safflower liquor of commerce, give 3 to 4 ends, then add to the same bath ½ gill sulphuric acid at 170° Twaddell. Give 2 ends more in this liquor, which is to precipitate the coloring matter into the fiber of the cloth. Wash, mangle and dry.—*G.*

Aniline Pink (50 lb.).—The yarns, well bleached, are entered at 110° F. in a water with—

Sulpnate of soda .. ..5 lb.
Pink (Baden Anilin Fabrik).....4 oz.

Turn well; lift, heat to 140° F., and finish. The dyeware should not all be added at once.—*C.*

Erythrosine Pink (50 lb.).—Add to a lukewarm water—

Sulphate of soda crystals.....5 lb.
Erythrosine B. S. (Meister, Lucius & Bruning).....5 oz.

Enter yarns at 120° F., and turn to shade, raising the heat gradually to 140° F. It is recommended to add the color—of course dissolved—in two equal portions.—*C.*

Phloxine Pink (50 lb.).—Dissolve common salt in the water till it marks 5° Tw. Add the solution of 6 oz. phloxine extra B B (P. Monet & Co., Geneva). Enter yarns at 70° F., and give five turns while the temperature is raised to 100 F.; wring and dry without washing.—*C.*

Safflower Rose (60 lb.)—Bleach; work as for safflower pink, but double the quantity of carthamine, and give a little more time —*C.*

Magenta (50 lb.).—Add to a water at 144° F.—
Tin crystals ..... 5⅞ oz.

And the solution of the same weight of magenta, which is added in two portions, giving six turns after each.—*C.*

Coralline Red (11 lb.).—Boil 35 oz. sumac or 2,790 grn. of tannin in water, and steep the cotton all night in the hot clear liquid. Wring out next morning, and enter in a fresh water at 122° F. with 17½ oz. good glue; wring out and dye to shade with coralline in cold water; wring again, and without washing dry in a room whose atmosphere is impregnated with ammonia. Aurine is dyed in the same manner as coralline.—*C.*

Magenta on Cotton Wool (110 lb.).—Add to a boiling water 5 lb. 7 oz. tannin. When perfectly dissolved enter the cotton and boil for two hours; reduce heat and steep for another hour. Dissolve 2 lb. 3 oz. soap, dilute the tannin beck sufficiently, and work the cotton well. Lift, drain in the centrifugal, and dye in a fresh water with 27—31 oz. magenta.—*C.*

Rose Bengale (P. Monnet & Co.)—Work the cotton for an hour in water, containing 5% of alizarine oil, dry, steep for two hours in cold red liquor at 2½° Tw., and enter in the dye beck, which for every 35 oz. cotton contains ½ oz. color and ¾ oz. of the above red liquor. The process takes one hour at from 112° to 140° F.

The red liquor is made by dissolving 3¼ oz. alum in 17¼ oz. water, and adding 1⅞ oz. acetate of lime, previously dissolved in another 17¼ oz. water. It is let settle, decanted, or filtered if needful, and set at 2½ Tw.—*C.*

Eosine.—Work the yarn in a soap beck, dry, and transfer to a beck of sugar of lead. Rinse and dry at a hand heat in an eosine beck. The

addition of a little acetic acid gives a yellower tone.—*C.*

Cochineal Red (10 lb.)—Boil 1 lb. best annatto with ⅔ lb. potash; strain the solution, and work the yarn in it at moderate heat. Wring, and take the yarn twice through a lukewarm water; wring and pass it into the solution of 2 oz. glue, to which 1½ oz. nitric acid has been added. Work for quarter of an hour, wring, and enter in a tin mordant at 10°—11° Tw. Work for half an hour, wring, and dye with 1¼ lb. cochineal.—*C.*

Wood Red.—Steep overnight in 12 lb. sumac; next morning spirit it in nitro-muriate of tin at 12° Tw. (cold). Wash off well, and dye with 10 lb. barwood and 30 lb. Brazil wood at a boil, turning for an hour.—*C.*

Barwood Red (10 lb.)—Boil out 2 lb. sumac, and add the decoction to a water in which the goods are steeped for six hours. Wring out, and work in so-called barwood spirit at 2° Tw. Wring, and enter in a water at 200° F. with 10 lb. rasped barwood, raise to a boil, which is kept up till the shade is obtained.—*C.*

Garancine Red on Cotton (11 lb.)—Prepare right at a boil with 2 lb. 3 oz. sumac. Dry and enter in a beck of red liquor at 7° B., where it is left for six hours, with frequent turning. Take out, and soak well in a fresh hot beck of 17¼ oz. elutriated chalk and 2 lb. 3 oz. cow dung. Rinse and dye in two becks. The first consists of 14 oz. garancine, 5¼ oz. sumac, and 7 oz. bran. Enter at 77° F., and raise the heat slowly to 167° F. Enter in the second beck, consisting of 27½ oz. garancine, 14 oz. sumac, and 7 oz. bran. Enter at 144° F., and raise slowly to a boil. The whole time in this second beck is an hour. Rinse, and raise at a boil for fifteen minutes, in a beck of 17¼ oz. curd soap. Rinse, and dry.—*R.*

Mock Scarlet (10 lb.).—Prepare in 30 gal. hot sumac liquor, with 1 lb. turmeric. Give seven turns, lift, and pass into a cold water with 1 pt. crimson spirit (nitro-muriate) of a tin (a solution of the perchloride); seven turns, wash, and enter in 30 gal. hot redwood liquor. Lift, wash, and if not full enough, take again through the spirit and the redwood liquor.—*C.*

Crimson Liquor for Padding Velvets.—Dissolve 2¼ lb. sal ammoniac in 6 qt. hot water; then add to it 6 qt. cold water and 9 lb. common salt, stir well until all is dissolved, and strain through a double cloth into a 12 gal. stoneware bowl. Add to the solution 2 qt. gum-tragacanth water, 4½ gal. sapan liquor at 8° Tw., and 1¼ pt. nitrate of copper at 78° Tw.; stir well for three minutes, add 7½ pt. oxymuriate of tin, stir, fill up the bowl with cold water, and strain for use. Pad once through at night and hang up to drain, run through the same liquor next morning and dry. When dry, turn over, expose to the air to cool, and after about two hours wash in 3 waters and dry.

If a more scarlet color is required, add 1 pt. black liquor to the above before padding.—*C.*

Cochineal Scarlet (100 lb.).—Boil 10 lb. annatto with 6 lb. soda ash; strain into a tub and enter the yarns in the liquid very hot; leave there for half an hour; lift and rinse in very warm water. Dissolve glue, 10 lb.; nitric acid, 7¼ lb. Pass the yarn into this solution lukewarm for a quarter of an hour; lift, wring, and pass into a tin mordant at 11° Tw. Keep it under the surface of the liquid for half an hour; lift, wring, and dye up in a water containing: Cochineal, 12 lb.; tin composition, 3 lb. Steep for a few hours. Top with magenta if needed.—*C.*

Cheapest Scarlet (100 lb.).—Pass for two hours into a decoction of 20 lb. turmeric; lift, rinse, and pass into a water containing 8 lb. sugar of lead and 5 lb. alum, for fifteen minutes. Wring and dye up in 3 or 4 oz. magenta, according to shade.

This scarlet will be blackened by sulphurous fumes, and will fade in the sun.—*C.*

Azo Reds (110 lb.).—Dissolve in water 6½ lb. curd soap and 2 lb. 3 oz. white glue in water. Enter the yarn and work for an hour, wring out, and pass into a cold water with perchloride of tin at 6¾° Tw. Work for an hour, lift and enter in a water of red liquor at 11¼ Tw. Work for two hours, lift and pass into a cold water containing more or less of the coloring matter as according to shade. Turn constantly, and raise the heat slowly to 190° F., let remain for some time in the hot flot, wring out, and dry.—*C.*

Or, for a cheaper and inferior color—

Dissolve sulphate of alumina, 10 per cent. of the weight of the yarn, and convert it into basic sulphate by the following process. Add gradually solution of soda, with constant stirring, till the precipitate formed does not entirely disappear, but leaves a few floating flakes. Then make a small quantity of a fresh solution of sulphate of alumina and add it very carefully, stirring continually, till these last flakes are dissolved, set the liquid at 14° Tw. Enter yarns for two hours, turning occasionally, lift and dye up in a fresh water with color = 10 per cent. of the weight of the cotton.—*C.*

Roe Color (11 lb.).—Work for an hour at 167° F. in a water of 17 oz. catechu. Lift and enter in a fresh water at the same heat with ¾ oz. chromate of potash. Lift and top in a fresh beck with about ¾ oz. alum and 30 to 45 grains of fustic.—*C.*

Bright Salmon.—Boil in a water 11 lb. sumac. Dissolve in the decoction 8½ oz. soda crystals, and stir in 13¾ oz. olive oil. Enter yarns, steep for an hour at 140° F., lift, add to the water 10½ oz. tin crystals, re-enter, turn for half an hour, wring and dye to shade in a fresh cold water with 8¾ oz. aniline orange, wring, rinse, and dry.—*C.*

Light Slate (60 lb.).—Boil 24 oz. logwood extract till dissolved, and add this to a warm water. Give yarns 5 turns, lift, and add 1½ pint black liquor. Three more turns, wash in cold water, and dry.—*C.*

Medium Slate (60 lb.).—As above, but take 3 lb. logwood extract and 3 pt. black liquor.—*C.*

Dark Slate (60 lb.).—Boil 6 lb. sumac, add the liquor to a hot water. Work 5 turns, and wring up. Boil 3 lb. logwood extract till dissolved, and add this to a warm water. Five turns, lift, and add 3 pt. black liquor. Give 3 turns more, wash in cold water, and dry.

These colors may be modulated by using along with the above ingredients small quantities of fustic and alum.—*C.*

Slate on Velvets.—Run 4 or 5 times through 60 gal. of logwood liquor, and 30 gal. of sumac. Add 4 qt. copperas liquor, run several times, wash, and finish.—*C.*

Turkey Red on Cotton.—There are several processes by which this desirable color is produced; of these the following is considered one of the best:

The goods are first steeped in soft water for about forty-eight hours to remove the sizing. A small quantity of malt liquor is usually added to this water to render the starch soluble, by transforming into dextrine and glucose.

The material is next boiled for half an hour or more in an acqueous solution of carbonate of soda, specific gravity, 1·01, wrung out, and oiled, by padding in a mixture of rancid oil and a very weak lye. For 100 lb. of goods: Gallipoli oil, 58 lb.; water, 15 gal.; carbonate of soda, ½ lb.; carbonate of potassa, ½ lb. When well oiled the cloth is hung up in the air until it feels dry, then hung up in a stove room heated to about 140°, where it is allowed to remain for about twelve hours. These oiling or padding and drying operations are usually repeated two or three times, according to the intensity of color required.

In the next operation the cloth is steeped for twenty-four hours in a cold emulsion composed of oil, carbonate of soda and water: water, 10 gal.; carbonate of soda, 5 lb.; oil, 50 lb. This having been pressed out, the pieces

are carefully rinsed in water, and passed slowly and repeatedly through the following solution, which is kept at a temperature of 150° Fah.: water, 30 gal.; ground gall-nuts (or sumac), 10 lb.; alum, 16 lb. They are then hung up for forty-eight hours in the stoveroom, kept at a temperature of 140° Fah.

Next follows the chalk bath—composed of about ten pounds of floured chalk in fifty gallons of water heated to about 180° Fah. Through this the pieces are passed, and after rinsing out, are ready for the dye beck.

The dyestuffs allowed for each piece in the beck are: Madder, 17 to 20 lb.; garancin, 3 to 5 lb., dissolved in about 300 gallons of water. Alizarine is now extensively used as a substitute for the above dyes.

When the goods are put into the beck, steam is let in and the temperature gradually elevated during one and one-half hours to 180° Fah.; then rapidly to near the boiling point, where it is maintained for about an hour. At the expiration of this time the pieces are wrung out, passed through a washing machine, then through the chalk bath, rinsed, returned for a short time to the dye beck, and finally washed out.

The red color thus obtained is dull and dark, and to brighten it properly requires three cleaning operations. These (or the first two) are performed in close boilers about two-thirds filled with water. In the first of these soap and carbonate of potassium are dissolved; soap, 6 lb.; carbonate of potassa, 1½ lb.; and the dyed goods are boiled therein by steam for about eight hours. After rinsing the pieces are boiled in the second boiler, containing, dissolved in the water, soap, 6 lb.; chloride of tin, 7 oz. After rinsing this boiling is usually repeated. Finally, the pieces are exposed for several hours to the atmosphere, then passed through a hot bran bath, and dried. The result is the peculiar deep, rich, and fast red so much prized.

It is well to remark here, for the benefit of those not skilled in the dyer's art, that success in the production of this color on cotton goods depends much upon the attention paid to matters of detail in carrying out the numerous operations, and it is common experience that at first good results are obtained only after repeated trials.

Slate on Cotton Wool (100 lb.).—Extract of logwood, 4 lb., sumac, 20 lb. Boil for fifteen minutes, enter the cotton, turn well, and let boil for an hour. Lift, drain well, and enter in a cold water in which have been dissolved, copperas, 8 lb., blue-stone, 4 lb.—*C.*

Slate (10 lb.).—Boil for an hour with soda, ½ lb. Make a decoction of sumac, 6 oz., enter yarns and steep for six hours, wring, and pass into a cold solution of copperas, 3 oz. Give six turns, rinse and wring, and pass back to the sumac bath for an hour.

Make a decoction of extract of logwood ½ oz. Enter in this for two hours; wring, and pass into another water containing the solution of bichromate of potash, 25 grn., and give five turns.—*C.*

Alizarine Violet (220 lb.). — Mordant with alizarine oil, and proceed as for a Turkey-red. Mordant again with sumac, 270 lb., or good pale myrobalans, 200 lb. Dry and pass into water, 175 qt., with copperas, 76 lb.; blue-stone, 15¼ lb. When the whole is dissolved, work the cotton in the liquid at a boil, wring, wash, and wring again. Dye to shade with "alizarine for violets," *i. e.*, such as contain no anthrapurpurine. When cold, wash in plenty of water and raise with soap only, very neutral, at a boil. If a very blue tone is required, raise with soap dissolved in a weak lye of soda-crystals, say 1½° Tw.—*C.*

Methyl Violet (50 lb.).—Boil yarn for two hours and wring. Make up a cold water with nitric acid, 5 oz., and starch, 1¼ lb., previously stirred up in cold water. Give a few turns, wring, and dye to shade in a lukewarm water with methyl violet, 1 lb.

Or, work well in a soap-lye, wring, and take through a solution of chloride of calcium or nitrate of lime. Rinse and pass into a very weak tannin bath, and dye in clear solution of methyl violet about 7 oz. of dry to 60 lb. yarn. —*C.*

Methyl Violet (22 lb.).—Dissolve tannin, 3½ oz., and curd soap, 1 oz., in hot water, add colza oil, ½ oz., and stir till an emulsion is formed. Work in this at 167° F. for fifteen minutes, lift, and wring. Make up another water at the same heat, with alum, 10¼ oz., and the filtered solution of methyl violet, 2 oz. Enter and dye to shade.—*C.*

Reddish Violet (11 lb.) -Mix starch, 4 lb. 6 oz., in cold water, pour in hot water, stirring constantly so as to form a smooth, even paste, and make up to 105 pt. at 100° F. Six turns and then steep for fifteen minutes, turning occasionally. Lift and add to water, 105 pt. at 100° F., alum, 1¾ oz., and soluble aniline violet, 30 grn. Six turns.—*C.*

Gentiana Violet (11 lb.).—Boil sumac, 35 oz., or tannin, 2,790 grn., in water, and steep the yarn overnight in the clear solution. Wring up and dye in a water at 165° F., containing gum arabic, 9 oz., adding the dissolved color as required. Wring, and dry.

Or, make up a water at 122° F. with tannin, 80 grn. for each 35 oz. cotton, and turn the yarns for four or five hours.

Wring and enter in the dye-beck at 110° F., to which acetic acid, 775 grn., are added per 11 lb. cotton.—*C.*

Spirit Purple (10 lb. Cloth or Yarn).—Prepare with stannate of soda at 10° Tw., sour in vitriol at 2° Tw., and wash twice in clean water. Make up a machine (tub for yarns) with 30 gal. logwood liquor, run three or four times backward and forward, add 4 qt. alum, ½ pt. double muriate of tin, and run three or four times through, and wash off in clean water.

Make up another machine with 30 gal. logwood liquor and 10 gal. redwood liquor, run three or four times. Add ½ pt. purple spirit and 4 qt. alum. Run through several times, wash, and finish.—*C.*

Fine Yellow (60 lb.).—Bleach, mordant in red liquor, boil 3 lb. picric acid in 3 gal. water, add this to a warm water, work five turns, and dry. —*C.*

Light Yellow (60 lb.).—Bleach, boil 3 lb. turmeric in 3 gal. water with 3 lb. alum, add this to a hot water. Work five times, wash, and dry.—*C.*

Straw Yellow (60 lb.).—Mordant with either red liquor or nitromuriate of tin. Boil 1½ lb. extract of fustic in 3 gal. water, and add to a warm water. Work yarn five turns, wash in cold water, and dry.—*C.*

Fast Yellow (60 lb.).—Bleach, dissolve 6 lb. brown sugar of lead in 6 gal. boiling water, and add this to a cold water. Work five turns, and wring. Dissolve 2 lb. bichromate of potash, and add it to another cold water. Work yarn five turns, wash in 2 cold waters, and dry.—*C.*

Dark Rust Yellow. Yarns and Cotton Wool (110 lb.).—Work up in a hot water 11 lb. yellow resin soap with 4 lb. 6 oz. annatto and 2 lb. 3 oz. young fustic. Steep for half an hour at a boil.

Old Gold on Cotton (100 lb. yarn).—Boil ¾ lb. flavine and dissolve 2 lb. alum. Enter yarn at 160° F., give eight turns, hang out, add to the dye 1 oz. Bismarck brown and ½ lb. redwood. Re-enter, turn to shade, wring, and dry.—*C.*

Bright Yellow (Turmeric).—72 lb. cloth, say 6 pieces, 70 yd. Run the goods in jigger in hot water to thoroughly and evenly wet them, then to 20 gal. hot water at 140° F. (60° C.), add 7 lb. turmeric, give four ends, then add to the same liquor 4 fl. oz. sulphuric acid at 170° Tw., and give the goods two ends more. Afterward wash, mangle, and dry.—*G.*

Chrome Yellow.—72 lb. cloth. Pad through acetate of lead, at strength of 8 oz. per gal.;

then pass into jigger charged with lime water, wash in water, and recharge jigger with 9 gal. water, in which is dissolved 1½ lb. bichromate of potash, give four ends and afterward wash. Should the yellow be rather too much of a gold color, one or two ends in weak hydrochloric acid will bring it back.—*G.*

Yellow Cannelle.—For 100 lb. bleached cotton, 10 lb. catechu, 4 lb. blue vitriol, ⅛ lb bichromate. Pass first through the catechu, and wring; then pass through the bichromate, and wash. Repeat the passes, and wash. Finish with 10 lb. quercitron bark.

Feather Dyeing.—1. In general terms, clean with carbonate of ammonia, wash, and steep overnight in solution of nitrate of iron 7° B., then rinse in water. Boil out equal parts logwood and quercitron and immerse the feathers at a "hand heat." When black, remove and wash in warm water. Dissolve 3½ oz. bicarbonate of potash in 5 qt. of hot water and stir in 17½ oz. of olive oil, shake until it becomes an emulsion. As before, at a gentle heat immerse in this, draw out the surplus moisture between the finger and thumb and dry over a stove, constantly shaking them. Experience and skill are necessary.

2. The feathers should be soaked in solution of ammonium or sodium carbonate, whereby they are rendered less liable to break or bend; after being dyed, they should be dried in a current of warm air. Feathers may be dyed black in the following baths: *a.* 100 pt. water, 1 lb. ignited sodium carbonate; *b.* ferric nitrate at 70° B.; *c.* 2 lb. logwood, 2 lb. quercitrine; ½ lb. feathers is digested in *a* at 30°, the feathers are then washed with warm water and soaked in *b*. After another washing they are boiled in *c*, until of a deep black color; they are then dipped in an emulsion formed by agitating oil and potassium carbonate together, and dried by gently swinging them in warm air.

3. Black.—By immersion for two or three days in a bath (at first hot) of logwood, 8 parts, and copperas or acetate of iron, about 1 part.

4. Intense Blue.—This color is a pale blue. It is sometimes, but improperly, called "Gens d'Arm." It is obtained with comparative facility upon soft, hard or ostrich feather, by an application of indigo carmine and archil. It is more difficult to produce it upon skins, wings, and birds. Of course, much indigo carmine and little archil should be used. Often, in order to make blacker, some black varnish is added to either the acidulated bath or to a separate or unacidulated one. This process, however, is not to be recommended; it is better to add a little more archil, and, at the same time, very little curcuma. Orange Z may also be taken.

5. Marine Blue.—This is a dull color, more or less violet tinted. It is obtained foom indigo carmine and lilac (violet is often substituted for this last color). To produce a deeper tint add a trifle more of archil. Even for very pale marine blue, nothing but indigo carmine and archil are sometimes taken. For a flat feather the violet is employed to advantage. As regards the ostrich, on the contrary, lilac is preferable, for the violet is easier produced, giving a more uneven color thon the lilac.

The bath should be acidulated with archil, not with sulphuric acid, that being too powerful. When the feather is in the boiling bath, indigo carmine is first poured in, and next a mixture of indigo carmine and lilac. To deepen the dye archil is added (but in exceedingly small quantities, as it produces considerable efficacy). Time must be given, however, to produce this effect, for it is known that archil bites slowly, and at a comparatively low rate of temperature. If too much archil be taken, it will suffice to give the feather another boiling hot bath with indigo carmine and violet.

The white ostrich feather of good quality easily takes a marine blue color with indigo carmine and lilac; but that which has been used a little, and above all the gray, becomes brown or rusty almost inevitably, as will be seen when we shall have occasion to speak hereafter of metallic reflects.

The difference in the nature of feathers belonging to one and the same lot is the cause of a very great inequality—some feathers being more reddish or greenish than others—so that after an energetic heating it is well, in drying the feathers, to range them in order of tint, and treat each species separately, boiling the hardest, or those feathers not reddish enough, longest in the original bath, and giving, on the other hand, a boiling hot bath of indigo carmine to those which are too reddish. This operation being evidently too long, is unfortunately inapplicable to cheap feathers.

For skins, wings and birds the same processes are employed. Much precaution must be had that not too much sorrel salt be used, and above all, that the process be effected as quickly as possible.

6. Bronze on Feathers.—Fashion has introduced gilded and silvered feathers. It is chiefly goose feathers and wings of pigeons, which appear covered with gold and silver. The process is very simple. The feather is dipped in bronze powder and rubbed with a piece of wash leather. In course of wearing, however, the bronze is very easily detached. To prevent this the feather, before being dipped in the bronze powder, is taken through gumwater, pressed nearly dry between cloths, and in its slightly adhesive state is treated with bronze powder.

Partially bronzed feathers and wings are produced by covering those parts which are to remain plain with pasteboard, and the bronze powder is rubbed upon the rest with a feather —*Faerber Zeitung.*

[Of course varied effects may be produced by dyeing the feathers with aniline colors, etc., prior to the application of the bronze.]

7. Feathers may be dyed brown by first treating them with catechu and then with potassium chromate; they can be dyed directly with aniline colors, and can be bronzed by painting with aniline violet dissolved in alcohol at 90%.—*Ding. Pol. Jl.*

8. Pearl gray is a mixture of violet-tinted blue, with very little black and much white. It is obtained by the same process that serves to make white—that is to say, by a mixture of indigo-carmine and violet. I shall not now return to a description of this procedure, and shall only state that in the personation of pearl gray the quantities of the coloring matters employed are somewhat augmented.

9. Giselle gray is a mixture of white with black. It is easily obtained by dyeing the feather with a small quantity of gloss black. As there is always a residue of yellowish hue it becomes necessary to give it a rose color with cochineal. This operation is effected in a cold bath acidulated with a small quantity of potassium binoxalate. If it be an ostrich feather, starch is dissolved in it.

10. Silver gray is a mixture of white and blue tarnished with black in very small proportion. Silver gray is obtained by employing roseate gray and blue gray in convenient proportions. These coloring matters are employed much diluted in a clear solution and an acidulated bath is prepared with acetic acid or sorrel salt. The bath should be cold and, for an ostrich feather, contain starch; it should be simply cold or tepid if a tender feather is to be dyed, and a boiling heat in the case of hard feather.

11. Felt gray is a yellowish gray. Is more recent than the preceding one, and every way preferable. It consists in employing felt gray in connection with rose-colored gray. These two substances, of easy application, will serve for the generality of the tints in question. If it were required to produce a somewhat roseate hue, cochineal or violet might be taken; if, on the contrary, a green one, a very small quantity

of indigo-carmine would be required. These coloring substances are applied, according to the feather and the tone of the color, in a cold, lukewarm, or boiling hot bath, acidulated with acetic acid or salt of sorrel.

12. Iron Gray, Steel Gray, etc.—These kinds of grays are usually rather darkish; the tints result from a mixture of blue, a good deal of black and some white. They are obtained on the feather by means of a conveniently proportioned mixture of roseate gray and blue gray, the shade being subsequently imparted, as in the case of the other gray species.—*Textile Colorist.*

13. Plum.—The plum color is a pale violet. The feather is dyed in a bath acidulated with sulphuric acid, archil, indigo-carmine and black gloss, so that an almost black garnet may be produced. It is well to add a little lilac. The feather is taken out of the bath only at this moment. It is rinsed in pure water and then given a violet tint in a more or less heated solution of carbonate of soda. During this operation the archil turns from red to violet. Black is developed and settles more firmly on the feather, while a large portion of the indigo-carmine goes off. It is a primitive process, and certainly not economical, but which, nevertheless, gives good results in skilled hands, but in the hands of unskilled operators it is extremely tiresome and of doubtful success.

14. Crimson.—A mordant of alum, followed by a hot bath of Brazil wood, and afterward by a weak one of cudbear.

15. Pink or Rose.—With safflower and lemon juice.

16. Plum.—The red dye, followed by alkaline bath.

17. Red.—A mordant of alum, followed by a hot Brazil wood bath.

18. Yellow.—An alum mordant, followed by a bath of turmeric or weld. Other shades may be obtained by a mixture of the above dyes. Feathers may also be dyed by simple immersion for two or three minutes in a bath of any of the aniline colors.

Gloves, to Dye. See *Kid Gloves* below.

Gutta Percha, Dyeing of.—After dissolving 2 oz. of gutta percha in chloroform, add 1 grn. of pure carmine, dissolved in a little pulverized gum and water. After the chloroform is distilled off, the gutta percha is to be thoroughly kneaded. Anything may be used in this way, according to the color required, such as ocher, ultramarine, etc.

Hats, to Dye.—The fulling-stock may be made the vehicle for dyeing or staining all fancy colors, as drabs, beavers, slates, mouse, tan, rosy drabs, and many others. Some makers partially dye and then complete the staining in the stocks.

1. Beaver.—Take 1¼ lb. copperas, 1 pt. pyrolignite of iron diluted with boiling water, 4 oz. Hoffmann's aniline blue, 4 oz. indigo extract (free from vitriol, or this will turn it green), for 1 doz. hats.

2. For the fulling-stocks, for 24 doz. 3 oz. bodies: 1 lb. common graphite (black lead), 3 lb. Venetian red, 1 gill indigo extract.

3. Light.—2 lb. red lead, 1 oz. indigo extract, 1 lb. common graphite, 2½ lb. terra castle.

Cream color for 24 doz. 3 oz. bodies: 2 lb. red lead, 2 lb. common terra castle, 2 gills indigo extract in liquor, 3 gills orchil.

Fawn color: 1½ lb. burnt sienna ground fine, ¾ lb. burnt umber, ¼ gill orchil, ¼ gill indigo extract in liquor.

Mouse color: 3½ lb. common graphite (black lead), 2½ lb. best terra castle, 2½ gills indigo extract in liquor, 4 gills orchil, 8 oz. red lead.

An ordinary drab for soft hats: ¾ lb. common graphite, ¾ lb. best ditto, 3 gills orchil, 2 gills indigo extract; put the graphite into a pan, cover with water, and let down with sulphuric acid at 30° Tw.

Rose: 2¾ lb. common graphite, 2 gills indigo extract in liquor, 5 gills orchil.

Slate: 4 lb. common graphite, 4 gills indigo extract, 3½ gills orchil.

Cinnamon: 3½ lb. red lead, 2½ lb. best terra castie, 2½ oz. picric acid, ½ gill indigo extract, 3 pts. orchil. The picric acid is first dissolved in hot water, and the other ingredients are added. See also *Straw* Dyeing below.

Bismarck Brown on Felt Hats (50 hats).—Prepare with soda as formerly directed and boil for forty-five minutes with 22 lb. fustic, 10½ oz. logwood, 3¼ lb. sumac, 8¾ lb. sanders and 17¼ oz. argol. Boil for two hours and add 2 lb. 3 oz. bluestone and 7 oz. copperas. Re-enter the hats and boil for three-quarters of an hour longer.—*R.*

Brown on Mixed Hats (5 doz.).—Prepare with soda and boil for two hours with 22 lb. fustic, 5 lb. 7 oz. madder, 25¾ oz. turmeric, 2 lb. 3 oz. madder, 25¾ oz. sanders and 17¼ oz. argol. Air the hats and add 17½ fl. oz. black liquor and 2¼ oz. copperas. Re-enter the hats and boil again for an hour.—*R.*

Chrome Brown on Felt Hats (50 hats).—Prepare with 4¾ oz. chromate of potash, 14 oz. argol and 17½ fl. oz. solution of tin. Let the hats lie overnight in the flot and dye the next morning in a fresh water with 17¼ oz. young fustic, 26 oz. fustic, 17¼ oz. turmeric, 6 lb. 9 oz. madder, 3 lb. 4 oz. peachwood, 7 oz. logwood. —*R.*

Horn, to Dye in Imitation of Tortoise Shell.—Orpiment (yellow arsenic sulphide) is mixed with limewater and applied with a brush.

2 Use nitrate of mercury. This gives a brown stain. The different dyes can be used on the same piece. See also *Ivory.* See **Staining.**

Ivory, to Dye.—Billiard Balls, to Color Red.—Soak the pieces for a few minutes in weak nitric acid, and then in a strong decoction of cochineal in ammonia water. Black.—Use nitrate of silver dissolved in water and expose the pieces to strong sunlight. Or steep for several days in a decoction of 2 lb. logwood, 1 lb. galls, and then for a few hours in acetate of iron (iron liquor). Green.—Steep in a solution of verdigris, to which a little nitric acid has been added, or in a solution of distilled verdigris in acetic acid. Sal ammoniac is sometimes added to this solution. Do not use metallic vessels. Purple.—Steep in a weak aqueous solution of terchloride of gold, or boil for some time in a strong aqueous solution of logwood extract, and then add 4 oz. of alum to the gal. of solution and continue boiling until the ivory is sufficiently colored. Yellow.—Steep for twenty-four hours in solution of lead acetate, and after drying in solution of potassium bichromate. Or steep the pieces in a saturated solution of orpiment (sulphide of arsenic) in strong ammonia and dry. The depth of color depends upon the degree of concentration of the solution. Blue.—Stain them green and then immerse in hot solution of pearlash. Or boil in logwood decoction and then in aqueous solution of copper sulphate. Or steep them in weak solution of sulphate of indigo, to which a little tartaric acid has been added. The coal tar colors, though brilliant, are apt to fade. Or by keeping the ivory immersed in a dilute solution of sulphate of indigo, partly saturated with potash, for some time, a fine blue color will be given to it.

Ivory, Dyes for.—I. (Red.) a. Make an infusion of cochineal in water of ammonia, then immerse the pieces therein, having previously soaked them for a few minutes in very weak aquafortis and water. b. Boil the bones with 1 lb. of Brazil dust, in 1 gal. of water for three hours, then add ¼ lb. of alum and boil for one hour more.

2. Black.—a Immerse the pieces in a weak solution of nitrate of silver for a short time, then expose them to the sunlight. b. Steep for two or three days in a decoction made with 1 lb. of galls and 2 lb. of logwood, then steep for a few hours in iron liquor (acetate of iron).

3. Green.—a. Steep in a solution of verdigris to which a little aquafortis has been added. b. Dissolve distilled verdigris in weak vinegar and steep the pieces therein. c. Steep in a solution of 2 parts of verdigris and 1 of sal ammoniac. Observe not to use a metallic vessel for the above.

4. Purple.—a. Steep in a weak solution of terchloride of gold. b. Boil for six hours in a decoction of 1 lb. of logwood in ½ gal. of water, adding more water as it wastes by boiling, then add 2 oz. of alum and boil for 1 hour more.

5. Yellow.—a. Boil for 1 hour in a solution made with 1 lb. of alum in 1 gal. of water, then take out the pieces and steep them in a decoction made with ½ lb. of turmeric in 2 qt. of water; lastly, mix the two liquors and boil them therein for one hour. b. Steep the pieces for twenty-four hours in a solution of sugar of lead, then take them out, and when dry, immerse them in a solution of chromate of potassa. c. Dissolve as much of the best orpiment in water of ammonia or hartshorn as it will take up, then steep the pieces therein for twenty-four hours; lastly take them out and dry them, when they will turn yellow. Remark. —By diluting the solution with water, any shade of yellow may be made.

6. Blue.—a. Stain them green, then steep them in a hot and strong solution of pearlash. b. Boil them in a strong decoction of logwood and afterward steep them in a solution of blue vitriol. c. Steep them for a short time in a weak solution of sulphate of indigo, to which a little salt of tartar has been added; or, still better, boil them in a dyer's green indigo vat. Remarks.—The bones of living animals may be dyed by mixing madder with their food. The bones of young pigeons may thus be tinged of a rose color in twenty-four hours, and of a deep scarlet in three days; but the bones of adult animals take a fortnight to acquire a rose color. The bones nearest the heart become tinged soonest. In the same way extract of logwood will tinge the bones of young pigeons purple.—*Mr. Gibson.*

Dyeing Ivory Black.—1. If the ivory is well washed in an alkaline ley, and is then laid for several hours in a dilute solution of neutral nitrate of pure silver, with access of light, it will assume a black color, having a slightly green cast.

2. A still finer black may be obtained by boiling the ivory for some time in a strained decoction of logwood, and then steeping it in a solution of red sulphate or red acetate of iron.

3. Immerse frequently in common black ink.

Green.—1. This is given by dipping blued ivory for a little while in solution of nitro-muriate of tin, and then in a hot decoction of fustic.

2. Boil in solution of verdigris in vinegar until dark enough.

To Dye Ivory Purple.—Steep the ivory in a weak neutral solution of terchloride of gold, then expose to the light. Or make a solution of sal-ammoniac into 4 times its weight of nitrous oxide. Soak the ivory in this. See **Staining.**

Vegetable Ivory, Dyes for.—For black, lay the articles for several hours in a strong aqueous solution of nitrate of silver, and then expose to strong sunlight; or boil in a strong decoction of logwood and then in solution of acetate of iron. For blue, immerse for some time in a dilute solution of sulphate of indigo, partly saturated with potash. For green, boil in a solution of verdigris in vinegar. For red, dip the articles first in a tin mordant and then into a hot decoction of Brazil wood or cochineal. Scarlet, use lac dye instead of the preceding. Violet, dip in the tin mordant and immerse in a decoction of logwood. For yellow, impregnate with nitrohydrochlorate of tin and then digest in a strong decoction of fustic. The coal tar colors are now generally used for this and similar purposes.

Jute Dyeing.—Jute differs markedly in its properties from cotton and linen. It is readily disintegrated by acids, and alkalies, caustic or even carbonated, are apt to turn it brown. It contains, however, a certain proportion of tannin, which enables it to lay hold of certain dyes, especially the aniline colors, more readily than cotton. Very high temperatures, and especially prolonged boiling, are avoided whenever possible in the treatment of this fiber.—*C.*

Dyeing of Jute Yarn.—Dark green for 10 lb. yarn. Prepare a hot bath with 1 lb. extract of quercitron and 1 lb. alum; soak the jute for an hour in this, take out, rinse, and pass through the two following baths. First bath—10 oz. nitrate of iron and 2 oz. tin salt; after ten turns take out, wring, and pass into the second bath of 5 oz. yellow prussiate and 3 oz. red prussiate; give ten turns, take out and add 5 oz. sulphuric acid; after ten turns in this bath, take out and wring. Red for 10 lb. bleached yarn: Mordant for an hour hot with 7 oz. tannin, wring, and place in a bath of phosphine; it is of the greatest importance only to employ the very best quality of the latter if a bright red is to be produced; ½ oz. of phosphine will be found sufficient for 10 lb. of yarn; lastly, the yarn is passed through boiling water in which a little saffranine is dissolved. Yellow for 10 lb. bleached yarn: Place the yarn into a cold bath of 3 oz. acetate of lead, give ten turns, take out, and wring, and pass into a bath of 3 oz. bichromate of potash, where it is left until the desired shade is obtained; to have a dark shade it is necessary to increase the quantity of acetate of lead and of the bichromate, and to give it a reddish shade the yarn is afterward passed through a weak bath of saffranine.

Black (54 lb.).—Dissolve 5½ lb. solid extract of logwood and 17 oz. extract of bark in water. Steep the jute for a quarter of an hour in the boiling beck, and enter in a fresh cold beck of 13 oz. red chromate and 8½ oz. bluestone. Give seven turns, take out, and re-enter in the logwood beck, in which 21 oz. soda ash have been dissolved in the meantime. Seven turns, lift, and dissolve 17 oz. copperas in the beck, re-enter, five turns, and rinse.—*C.*

Cheap Black (110 lb.).—Take 5 lb. 7 oz. extract of logwood, 2 lb. 3 oz. lime, and 4 lb. 6 oz. copperas, and dissolve each separately. Give the yarns three turns at a boil in the solution of the extract, drain, but do not wring; take through the limewater and immediately after through the copperas, giving three turns in each.—C.

Superior Black (110 lb.).—Take 7 lb. 6 oz. extract and proceed otherwise as above. When drained from the copperas return to the extract.

Blue (100 lb. yarn).—Dissolve, 2 lb. alum; ½ lb. tin crystals, 10 oz. serge blue. Enter yarn, and boil for twenty minutes.

Gensd'armes Blue (100 lb.).—Dissolve 2 lb. alum, ½ lb. tin crystals, 8 oz. serge blue, 3 oz. aniline green. Enter yarn, and boil for twenty minutes.—*C.*

Blue (220 lb.).—Dissolve in separate vessels, alum, 11 lb.; soda crystals, 7 lb. 10 oz.; tartar emetic, 5 lb. 7 oz. Pour the solutions all at once together, and let settle. The clear liquid is used with 22 gal. water at 158° F., and the jute is dyed, adding the color (previously dissolved in water) by slow degrees till the shade is obtained. The color is the "Bradford Blue" of the Baden Aniline Co.—*C.*

Blue on Bleached Jute Yarn (110 lb.)—To a warm water at 104° F., add: Alum, 17½ oz.; soda, 3½ oz.; tartar emetic, 1¾ oz. Dye with methyl blue, soluble in water (Baden Aniline Company), using more or less according to shade.

Blue (110 lb. Bleached Yarn).—To a warm water at 104° F., add alum. 17½ oz.; soda, 3½ oz.; tartar emetic, 1¾ oz. Dye to shade in methyl blue, soluble in water (Baden Aniline Co.). C

Brown (22 lb.). — Make a boiling decoction of 3¼ lb. catechu, dissolve in it 3½ oz.

blue-stone. Work the jute for an hour. Wring and make up a second boiling water with 7 oz. bichromate of potash, ten turns, rinse and wring. Raise and top in a fresh water with 75 grn. Bismarck brown and 3½ oz. sulphate of soda. For redder shades a little magenta or garnet may be added.—*C.*

Another Brown (11 lb.).—Mordant at a boil with 2 lb. 3 oz. sumac. Give a few turns, lift, and add to the beck 1¾ oz. tin crystals. Give a few more turns, and make up a water with 2 lb. 3 oz. logwood, 2¾ oz. magenta, 13¾ oz. alum. Work for an hour in the cold, lift, and add 2¾ oz. chromate of potash, seven or eight turns, rinse and dry.—*C.*

Bismarck Brown (11 lb.).—Wet out and dye with ½ oz. to 1 oz. vesuvine.—*C.*

Brown (11 lb.).—Extract 35 oz. catechu in boiling water and dissolve 3½ oz. bluestone in the clear. Enter the jute in this for two or three hours at a boil. Lift, and dissolve 8¾ oz. chromate of potash in a boiling water, pass the jute through this, and then through clear water. Top in a fresh water with 80 grn. Bismarck brown, 4½ oz. alum, and 17½ oz logwood.—*C.*

Dove Color.—Mordant in red liquor at ¾° Tw. and 86° F. Dye in fresh water at the same heat, with a very little methyl blue and less saffranine.—*C*

Gold (22 lb.).—Enter the bleached yarn for twenty minutes in a lukewarm bath of sugar of lead. Wring, and give ten turns in a new cold water containing 7 oz. bichromate of potash, and rinse. For deeper shades increase the sugar of lead and the bichromate. For redder tones take the dyed jute through a lukewarm water containing a little garnet, or a very red aniline violet, previously dissolved in boiling water.—*C.*

Golden Bronze.—Work in weak catechu liquor at 122° F., then pass into bichromate of potash at the same heat, and lastly dye to shade with a mixture of phosphine and vesuvine (Baden Aniline Co.) at 122° F.—*C.*

Golden Orange (110 lb.).—Mix 11 lb. alum and 17½ oz. tin crystals in sufficient water, run off the clear, and steep the jute in it for half an hour, and dye at a hand heat in a separate water with chrysoidine and phosphine RN (Baden Aniline Company) according to shade. Add a little tartaric acid toward the end, to raise the color.—*C.*

Light Green (11 lb.).—Mordant for two hours in the solution of 7 oz. tannin. Make up a fresh water with 1¾ oz. malachite green, enter the jute and work for half an hour. For yellower tones add to the dye beck picric acid or aniline yellow.—*C.*

Fast Green (22 lb.).—Work for half an hour in a hot water containing 27¾ oz. extract of bark and 14 oz. sulphate of alumina. Wring, and prepare two waters: *a*. 15½ oz. nitrate of iron and 3½ oz. tin crystals: *b*. 3½ oz. yellow prussiate. Work for twenty minutes in *a*; wring, and pass into *b*. Ten turns, lift, and add 14 oz. sulphuric acid; ten turns more, lift, wring, rinse and dry.—*C.*

Night Green (11 lb.).—Prepare at a boil for three hours with the clear decoction of 8¾ oz. sumac. Wring, and enter in a beck of 1¾ oz. methyl green. If a yellower tone is wanted a little picric acid may be added.—*C.*

Green (110 lb.) —Mordant with red liquor at 4½° Tw. and 17½ oz. tin crystals. Let steep an hour, enter in a strong hot decoction of fustic, wring out and dye in a fresh water with 17½ oz. alum and acid green (*vert a l'acide*, of Monnet & Co.) according to shade.—*C.*

Aniline Green (45 lb.).—Prepare hot with 5 lb. sumac for one hour, and then mordant with 4 lb. alum and 2½ lb. sugar of lead. Let it lie for a couple of hours, and dye it warm with the aniline green previously dissolved.—*C.*

Light Green (11 lb.).—Boil out 8¾ oz. sumac; steep for three hours in the clear boiling liquor. Lift, and make up a fresh cold water with methyl green; enter and work till level. For yellower tones add picric acid.—*C.*

Mode Green on Jute Yarn (110 lb.).—Mix 3 parts fustic liquor and 1 part logwood liquor with the necessary quantity of water at 122° F.; ten turns, lift, add ¼ oz. each copperas and bluestone; re-enter, turn well, and wash. Top at 86° F. with vesuvine and a little methyl blue (of the Baden Aniline Co.).—*C.*

Gray (11 lb.).—Boil 17 oz. sumac in water, and steep the jute for an hour in the liquid. Lift, and dissolve the same weight of copperas. Enter the yarns, and dye to shade. For a blue gray make up a fresh beck at 77° F. with 17 oz. alum and ⅝ oz. extract of indigo. Add a very little solution of magenta, enter the jute, and dye to shade.—*C.*

Mode Gray (11 lb.).—Boil 17 oz. prepared catechu, add solution to a water at 100° F., and dissolve therein 1¾ oz. bluestone. Wet out the jute at 100° F., enter, and work for an hour. Lift, and add the solution of 1¾ oz. chromate of potash; re-enter, work to shade, rinse, and dry.—*C.*

Pansy (11 lb.).—Wet out perfectly at 100° F., lift and add ½ oz. or a little more of dissolved violet (Hofmann's or methyl). Enter, five turns, and dry.—*C.*

Red (11 lb.).—Mordant hot for an hour with 8¾ oz. tannin; lift, wring, and enter in a beck of phosphine or aniline orange, and top with a solution of saffranine at 113° F.

If aniline orange is too dear, yellow coralline may be used.—*C.*

Crimson (11 lb.).—Wet out perfectly in water at 100° F., and dye with ¼ oz. to ½ oz. magenta.—*C.*

Wood Red (25 lb.).—Dye the half bleached yarn, hot, with ¾ lb. annatto which has been boiled with 6 oz. soda ash. Steep the yarns for an hour in the solution. Wring and enter in a cold water with 2 lb. stannate of soda. Lift, and enter in a lukewarm water with 4 to 5 lb. alum; turn for half an hour, wring, and dye up with peachwood liquor (12 lb. wood).—*C.*

Wood Crimson (25 lb.).—Make a decoction of 4 lb. sumac, add it to a hot water, and steep the yarn overnight; wring, spirit with stannate or nitro-muriate of tin, and dye in peachwood liquor.—*C.*

Azo Red (110 lb.).—Dissolve 11 lb. cake alum, and add so much solution of soda that the precipitated form ceases to disappear entirely on stirring the liquid. Then add a little of a fresh solution till the last traces of the precipitate are just dissolved. Set the solution at 14° Tw.; enter the clear goods, and work for two hours, turning occasionally. Lift, and pass into a fresh water, containing 1 lb. dye for 10 lb. yarn.

The same process is applicable to hemp.—*C.*

Scarlet on Jute Yarn.—Mordant with red liquor at 8¼° Tw. and 122° F.

Dye to shade in a fresh water at the same heat with "écarlate R R" (of P. Monnet & Co., Geneva).—*C.*

Rose on Bleached Jute Yarn.—Mordant at 122° F. in red liquor at 8° Tw., and dye in a fresh water with saffranine at the same heat.

Kid Gloves, to Dye.—The gloves are stretched over a wooden hand, and the color is spread upon them with a brush.

Black.—The glove is washed in alcohol, and three times brushed over with a decoction of logwood, allowing between each brushing ten minutes for drying; afterward dipped into solution of iron protosulphate, and then brushed with warm water. Should the color not prove sufficiently dark, a decoction of quercitron may be added to the logwood decoction. Instead of the protosulphate, some nitrate of iron may be used. As the leather begins to dry, it is rubbed over with talc powder and some olive oil, and pressed between flannel. The treatment with talc and oil is repeated, and the glove then allowed to dry on the stretch-wood.

Brown.—The solution is made up of varying quantities of decoctions of logwood and Guinea

wood. For darkening, a small quantity of iron protosulphate is employed.

Russia-red.—Decoction of cochineal with a tin salt and some saccharic acid, and, if a dark tint is demanded, addition of some logwood extract.

Gray.—Brushing with decoction of sumac and subsequent treatment with a feeble solution of iron protosulphate. Addition of logwood and yellow Brazilwood to the sumac decoction produces a greenish gray tint.—*R.*

The aniline colors can be employed without any previous preparation of the leather. The bluish tint so greatly liked in black gloves is obtained by washing the finished article with sal ammoniac solution. If it is required to keep the seams white, they are covered with flour paste with which some fat has been admixed. Instead of brushes, one may sometimes use a sponge.—*Ding. Polyt. Journ.*

Kid gloves of good quality, especially when light colored, are often thrown away when soiled, and made no further use of. By employing the following simple means, they might easily be dyed violet, black, or yellow, by the owner himself, and made to look almost equal to new: The gloves are first soaked in a little hot water containing dissolved crystals of soda or potash, whichever color may be desired, and after a twenty-five minutes' bath they are taken out, washed, rinsed, and wrung. When the gloves are thus cleaned, they are stretched tightly on a block, and the dye applied.

Straw.—After cleaning as in white and rinsing well in water, two baths are prepared: 1. A bath of soda at ½° B. 2. A bath of nitrate of iron at the same strength.

The gloves are brushed first with No. 1, then dried and brushed with No. 2, and finally with water, and dried at a gentle heat. They are then finished with the following mixture: Yelk of egg, 155 grn.; glycerine, 77 grn.; water, 1¾ pt. When half dried they are rubbed with clean flannel.

For modes and grays they are cleaned with soap in the usual manner, and after they have been brushed with water, they are brushed over with the following mixture at 104° F.: Logwood, 45 grn.; orchil, 8½ oz.; water, 1¾ pt. Boil. A second bath is prepared of 30 grn. of nitrate of iron in 35 oz. of water, and is applied with the brush to produce a gray tone.

Violet.—According to the tint desired, aniline or orseille violet must be used. Apply a little of the color by means of a brush or rag dipped in the coloring liquid. Lay on several coats of alum dissolved in water; then dry. Then apply one or two layers of the dye, which must be always hot. The kid is polished, before finally drying, with a pad made of a cork covered with a piece of woolen cloth. This is the best way of regaining the gloss.

Black.—The same means are employed throughout.

Yellow.—This requires a less complicated process—a decoction of Avignon crystals with alum. Apply several layers, and polish the kid in the way indicated above.—*Text. Manuf.*

Simple decoction of onion peel is said to produce upon glove leather an orange yellow superior in luster to any other. It is also said to be suitable for mixing with light bark shades, especially willow bark, and as a yellow for modulating browns. The onion dye is said to fix itself readily, even upon leathers which resists colors, and color them well and evenly.—*Chem. Rev.*

White.—The gloves are placed on a wooden hand, and then brushed over with a soft paint brush steeped in curd soap, 155 grn.; milk, 35 fluid oz. They are then dusted over with fine Venice talc, and rubbed with a bit of clean flannel. If this process does not leave them white enough, it is recommended.

Leather, Dyeing of.—Aniline Colors for Dyeing Leather.—(Aniline colors of the Berlin Co. referred to.)

1. For the production of so-called "Russian red"—formerly obtained with the red woods, along with a solution of tin and the occasional addition of alum or of tartar—the "Juchtenrath" or "leather-red" is recommended. It is produced in three shades—G, light; G R, medium; and R, dark. The color required is simply dissolved in 100 parts of clean, soft, boiling water, condensed steam-water being very suitable. The solution thus obtained is left to settle for two or three hours, and the clear liquid is then taken in greater or less quantity, according to the size of the pair of skins to be treated, diluted with warm water, and is then ready for use. It is not desirable to use a concentrated bath at the outset. The first pair of skins is therefore dipped at the beginning in a very dilute bath. They are then taken through a second and a third, each stronger than the foregoing. The second pair of skins is dipped in the second of the baths already used, then in the third, and lastly in a new bath as strong as the third before it had been used. Thus each bath is used three times, and each pair of skins is passed through two old baths and one new one. In this manner the color is thoroughly used up, and an even shade is obtained on the the skins, which, if entered at once in a strong dye-bath, would take the color irregularly, and become cloudy. When dyed, the skins are plunged in pure cold water, rinsed, placed on the stretcher, and slightly oiled. If birch-oil is used, for the sake of the peculiar odor of Russian leather which it imparts, care must be taken that no free acid is present, as always happens if the oil has been sophisticated with wood-tar; it must be carefully neutralized with carbonate of soda. The dyed leather should be rapidly dried in a room specially fitted up, as the aniline colors can endure higher temperatures than shades obtained from the woods. For moistening the leather for the subsequent finishing operations, very dilute solutions of "G" may be used.

2. A fourth shade, GG, gives a yellower red.

3. Another, "Red S," gives the cochineal shades, especially pink. In the use of this dye the bath must be made as hot as the leather can bear.

4. An addition of saffron (? safflower or saffranine) decoction, as in the treatment with cochineal dyes, enhances the brilliancy of the color.

5. Most yellow dyes derived from coal-tar produce dark spots on such portions of the grain-side of the leather as have been scratched or scraped. Certain colors, however, prepared by the Berlin Company are free from this defect. Phosphine-orange gives the "brightest" and most intensely yellow of the yellowish-brown shades, commonly termed "almond-yellow." It requires 500 parts of water for solution, and must be boiled *till no* residue remains. The liquid is then ready for use at once without dilution. If a less fiery shade is wanted, treatment with a solution of bichromate of potash lessens the vividness of the dye.

6. For a gold-orange color, the Philadelphia yellow of the same company is recommended, dissolved in 300 parts of water.

7. A redder shade is produced by "Berlin brown G," which is well fitted for reddening the darker shades produced with the dye-woods.

8. A pure orange may be obtained with "corallin" dissolved in 150 parts of water. It must be dyed and afterward dried as rapidly as possible, as it has a tendency to fade.

9. A "half-dark subdued blue" is produced with "marine blue" dissolved in 300 parts of water. The skins must not be previously passed through dilute sulphuric acid.

10. For a pure light blue, "water-blue B B" is taken; and for redder shades, "water-blue R."

11. Dark blues were formerly obtained by the use of a red dye-ware over a vatted

ground. The result is better obtained by grounding in "water-blue R," and topping with "nigrosin" dissolved in 300 parts of boiling water. Nigrosin applied directly to leather dyes uneven shades.

12. "Methyl-green" is much used for topping skins which have been dyed green with extract of indigo and fustic. All sulphuric acid must first be carefully washed away.

13. "Methyl-violet" can be successfully used even on the worst skins.

14. The "B" variety yields blue shades, and the "R" produces red shades. The color is dissolved in boiling water, but may be used cold. —*Chem. News.*

1. Blacks.—½ gal. vinegar, ½ lb. dry lampblack, 3 lb. sifted iron rust; mix, let stand for a week, lay three coats on hot; and rub with linseed oil. See also **Blacking.**

2. ½ lb. good galls, well broken, ¼ lb. logwood, 3 oz. iron sulphate; makes about 2 gal.

3. Wet with iron liquor and rub with a piece of iron; then oil, or give a dressing of composition made by melting 2 oz. black rosin and adding 3 oz. beeswax. When thoroughly melted take from the fire and add ½ oz. fine lampblack, which has had ½ drm. Prussian blue mixed with it; thin with turps just before it gets too cold. Apply a coat of this with a rag, and polish with a soft brush.

4. Ball Black.—For harness leather straps this is made of ¼ oz. isinglass, ¼ oz. indigo, 4 oz. logwood, 2 oz. soft soap, 4 oz. glue, softened, and 1 pt. vinegar; the whole is mixed, warmed, strained, and allowed to cool, when it is ready for use.

5. Hatters' Black.—This black is unequaled for finishing. It is made by dissolving 1 lb. extract of logwood, ½ oz. bichromate of potash, and 1 oz. copperas in 1 gal. water.

6. Patent Leather Black.—Mix together ½ lb. each of ivory black, purified lampblack and pulverized indigo, 3 oz. dissolved gum arabic, 4 oz. brown sugar and ¼ oz. glue, dissolved in 1 pt. water; heat the whole to boil over a slow fire, then remove and stir until cool, and roll into balls.

7. Vinegar Black.—This is the most simple and useful coloring liquid for the trimming shop for blacking leather straps. To make the simplest, and without doubt the best, procure shavings from an ironturner, and cover them with pure cider vinegar; heat up and set aside for a week or two, then heat again and set in a cool place for two weeks; pour off the vinegar, allow it to stand for a few days, drain off, and cork up in bottles. This will keep a long time, and while producing a deep black on leather, it will not stain the hands.

8. 4·2 oz. bruised gallnuts and 17·5 oz. green nutshells are boiled in 26·25 oz. rainwater; when the mixture has boiled one hour the liquor is strained through a cloth; the leather to be colored is first stained with the solution of iron filings, common salt and vinegar, as given under purple, before the above decoction is applied.

9. Black on Leather.—Dissolve 1¾ oz. solid logwood extract and ¾ oz. solid fustic extract in boiling water, and make up to 35 fluid oz. The leather, which must have been previously cleaned and stretched out, is brushed over five times at 100° Fah.; 155 grn. of chromate of potash and 77 grn. bluestone are then dissolved in the same quantity of water; the leather is brushed twice with the solution, and then again with the decoction of logwood; 150 grn. of liquid ammonia are then poured into 35 fluid oz. of water, and the leather is gone over with that. To make the leather supple, stir up 150 grn. yelk of egg in 75 grn. of glycerine, make it up with water to 35 fluid oz., and rub the leather with it. Let it get half dry, and rub with a clean woolen rag.—*R.*

Blue Black.—The following is recommended as a good composition for dyeing leather a blue black: Beeswax, 3 oz.; black resin, 2 oz.; melt together, and then add Prussian blue, 1 oz.; lampblack, ½ oz. While the mixture is cooling, add turpentine till a suitable consistency is obtained. It should be applied with a soft rag, and the leather afterward polished with a brush.

Staining Light Leather, Black.—Simple treatment with solution of iron sulphate or copperas will dye leather black. Acetate of iron may be used instead of above with advantage. The leather may first be mordanted with solution of logwood extract.

Blue on Leather.—1. Extract 155 grn. of gallnuts in 35 fl. oz. of water and brush over. Dissolve 155 grn. of soluble aniline blue and 75 grn. of glue in 35 fl. oz. of water. Brush over three times; dry and finish with yelk of egg.—*R.*

2. 2·2 lb. elderberries are boiled with 1·05 oz. alum, free from iron, in 2·2 lb. wine vinegar, and this solution is also filtered. If leather is to be colored blue, the decoction of elderberries is applied uniformly with a sponge. When the coating is dry, it is brushed over lightly with solution of blue vitriol in vinegar.

Browns, Russets, Reds, Yellows.—The use of russet and brown leather for reins necessitates the employment of stains of various shades in the workshop in order that the reins or other straps may be of a uniform color after being worked. In most cases rein leather is stained by the currier, but when worked the freshly cut edges need to be stained to correspond with the grain. The stains used are generally made of Spanish saffron and annatto, or of saffron alone, made up in various ways, the most common and reliable being the following: 1. Boil a given amount of saffron in water until the color is extracted; cut a quantity of annatto in urine and mix the two together, the proportions of each determining the shade. The more annatto used the darker is the color.

2. Another manner of preparing this stain is to boil ½ oz. Spanish saffron and ¼ oz. annatto in water until the dye is extracted, to which must be added some alcohol to set the color.

3. To make a stain of saffron alone, boil a quantity in water until the dye is extracted; strain off, and when cold add alcohol in order to set the color. The shade may be changed by adding oxalic acid in varying quantities, according to the color required. The proportion cannot be given with any degree of accuracy, as the color is a matter of taste and can be regulated by using greater or less proportions of each article.

4. Another saffron stain is made by boiling saffron in a small quantity of water until the color is extracted, and reducing with urine. In using any of these stains apply them with a cloth, and when nearly dry rub with a woolen rag slightly waxed.

5. A yellow stain is produced by boiling fustic berries in alum water; the shade may be darkened by the addition of a small quantity of pewdered Brazil wood boiled with the berries.

6. Another yellowish-red stain is made of Brazil wood and yellow berries in proportion to suit, boiling them in water until the coloring matter is extracted. This can be applied to sides that have not been stained, when intended for flat reins, halters, etc., in the following manner: Lay the leather upon a table and rub the flesh side with a warm stretching iron; turn it over and moisten the grain side with water, and rub with a copper stretching iron until the leather is nearly dry; then apply the coloring matter to the grain and rub with a copper slicker. When the leather is perfectly dry rub the grain with a glass slicker. An edge stain is made by adding a small quantity of alum to the above-mentioned ingredients.

7. A brown stain is made by boiling equal parts of pine and alder barks in six times their bulk of water until all the coloring matter is extracted, and when cold adding a small quantity of alcohol. Saffron boiled for twelve

or fifteen hours gives a good brown stain, to which alcohol must be added to make it set.

8. Picric acid and water, in proportions of 1 to 10, heated to a blood heat, make a good yellow stain. Weld boiled in water also makes a yellow stain. An orange-yellow is produced by boiling fustic berries in alum water. This stain may be converted into a rich brown by washing the leather to which it has been applied, before the stain is fairly dry, with an alkali.

9. A red stain is produced by boiling Brazil wood in lye. If mixed with weld it produces a brownish yellow, well adapted for use on halters and bridles.

10. An edge stain for russet leather is made by cutting 11 oz. annatto in 2 qt. urine, allowing it to stand for twenty-four hours, then adding 3 qt. water and boiling until reduced to one-half the original quantity. All stains appear to better advantage, and are rendered more durable, by being covered with a shellac varnish, which should be applied after the reins are all dry, and then finished up. The shellac should be applied with a sponge.

11. A bright orange stain is made by mixing yellow aniline with alum water.

12. 1 oz. oxalic acid, 1 oz. spirits of salts, 1 scr. bruised cochineal and 1 pt. boiling water, make a good brown stain.

13. Another red stain is made by dissolving 1 oz. cochineal in ½ pt. hot water, and adding 1 gill spirits of hartshorn.

14. A bright crimson stain is alum or tin salts and a decoction of cochineal.

15. For sole leather, 185 dr. Paris yellow, 37 dr. chrome yellow, 312 dr. pipeclay, 250 dr. alum, 250 dr. quercitron, 185 dr. sulphuric acid, 1¾ pt. tragacanth solution, boiled together with 7 pt. water, and the mixture, when cold, suitably applied.

16. Brown on Leather.—Dissolve 75 grn. of tannin in 35 fluid oz. Bismarck, and brush the stretched leather. Dissolve 75 grn. Bismarck brown and 45 grn. white glue in 35 fluid oz. water, and brush at 100° Fahr. If a darker shade is desired, brush over with a solution of 15 to 45 grn. of methyl violet in 35 fluid oz. water, and let dry. Finish with yelk of egg as above.—*R.*

17. Brown.—17·5 oz. dried and powdered nutshells are boiled for one hour in 52·5 oz. milk of lime, and strained through a cloth. This decoction is applied frequently to the leather. 4·2 oz. ground logwood, 4·2 oz. annatto are boiled in 17·5 oz. rain water, and a solution of 0·52 oz. carbonate of potash in 2·62 oz. vinegar is added to the above decoction.

18. A brown stain is also obtained by rubbing together upon a marble slab, 4·2 oz. umber, 0·52 oz. finest lampblack, in oil, with 17·5 oz. oxgall.

19. Yellow.—0·52 oz. saffron, cut in small pieces, are digested in 2·1 oz. alcohol 80% strong, for several days at a moderate heat. The solution is filtered, and applied directly to the leather.

20. Yellow.—17·5 oz. ground yellow wood or 17·5 oz. birch leaves are boiled for one hour in 2·2 lb. vinegar, and the fluid is strained. The articles to be stained are first covered with a solution of 1·05 oz. carbonate of potash, with a sponge to the leather, which has first been stretched, and when this has become dry, apply the coloring liquor also with a sponge.

21. Bright Yellow.—1·05 oz. finely powdered turmeric and 0·52 oz. gamboge are digested at a gentle heat for a few days in 26·25 oz. alcohol 80% strong, and the fluid is then filtered. The process is the same as 20, either with or without alum or carbonate of potash.

22. 17·5 oz. barberries are boiled in 2·2 lb. water, and the decoction is filtered. In this case also a solution of alum or carbonate of potash in water is used before applying the decoction to the article.

23. Yellow.—17·5 oz. wold are boiled in 3·3 lb. water for one hour, and used in the same manner as 22.

24. Yellow on Leather.—Brush over with a solution of soda at ½° Baume, dry and brush over with nitrate of iron at the same strength; repeat, if not dark enough. Finish with yelk of egg. This will be a buff rather than a yellow.—*R.*

Gray on Leather.—Dissolve 155 grn. of tannin in 35 fluid oz. of water, and brush. Dissolve 30 grn. of copperas in 35 fluid oz. of water and brush. If not dark enough, repeat. Dry and rub with rye meal.—*R.*

Green.—1. 1·57 oz. verdigris and 0·52 oz. sal ammoniac are dissolved in 8·75 oz. wine vinegar. If a small quantity of saffron extract is added to this, a yellowish-green color, the so-called parrot-green, is obtained. 2. If leather is first coated with a solution of Berlin blue, and then with a yellow stain, a beautiful durable green will be obtained.

Green on Leather.—Extract ¾ oz. of gallnuts in 35 fluid oz. of water, and brush over the leather three times; dissolve 155 grn. extract of indigo and the same weight of alum in 35 fluid oz. of water, and brush over and dry with the cold solution. Dissolve 155 grn. extract of fustic in the same quantity of water, and brush twice. Dissolve 77 grn. glue in the same quantity of water; dry, and finish with yelk of egg as above.—*R.*

Lilac on Leather.—Dissolve 155 grn. of tannin in 35 oz. of water, and brush. Then dissolve 77,155, or 30 grn. methyl violet, according to shade, in 35 fluid oz. of water, and brush over thrice. Dissolve 155 grn. of glue and the same weight of glycerine in 35 fluid oz. of water, brush and dry.—*R.*

Mode on Leather.—Extract 45 grn. of logwood in 35 fluid oz. of water, and dissolve it in 30 grn. of orchil. Brush the leather with the solution at 110° Fahr. Next dissolve 30 grn. copperas in 35 fluid oz. of water; brush with the solution, and then brush with water. If a reddish tint is desired, dissolve along with the copperas 30 grn. of alum. When dry rub the leather with a woolen rag and rye meal.—*R.*

Purple.—8·75 oz. Brazil wood shavings, or 2·1 oz. scarlet berries, are boiled in 2·2 lb. water in an earthen pot or in a bright copper boiler. The decoction is filtered and compounded with a sufficient quantity of fluid chloride of zinc to obtain either a lighter or a darker color.

Crimson.—A solution of 0·14 oz. cochineal, 0·14 oz. cream of tartar, 0·42 oz. solution of zinc, is prepared. The mixture is thoroughly shaken, and the contents of the bottle are exposed to heat for twenty-four hours. Spirit of sal-ammoniac is then added in drops until the desired color is obtained.

Red.—1. 8·75 oz. shavings red Brazil wood are placed in a bottle, 2·2 lb. wine vinegar is poured over them, and they are digested for eight days, and stirred frequently in the meanwhile. The solution is then filtered through a cloth. Meantime a solution of 1·05 oz. alum free from iron in 8·75 oz. water is prepared and the above preparation of Brazil wood is added to this under constant stirring. A very beautiful red is obtained in this manner. The shavings of Brazil wood may also be boiled in rain water, and this be compounded with a solution of bitartrate of potash.

2. Cochineal.—1·05 oz. of the finest cochineal is powdered and digested in 17·5 oz. alcohol 80% strong, until it is dissolved; the solution is then filtered. More or less cochineal is taken according as the color is required to be darker or lighter.

3. Scarlet.—1·05 oz. scarlet berries are bruised and dissolved in 4·2 oz. alcohol, 80% strong, and the solution is filtered.

Violet.—17·5 oz. Brazil wood are boiled for one hour in 0·44 oz. water, and the decoction is then filtered. Another solution of 4·2 oz. copperas in 8·75 oz. water is prepared, and this is

mixed with the decoction of Brazil wood. Violet stains are also obtained by mixing red and blue stains together.

Linen Dyeing.—The properties of linen, as far as its behavior with mordants and dye wares is concerned, do not essentially differ from those of cotton. It is, however, less able to resist strong acids and chemicals. The proportion of linen goods dyed and printed is but small in comparison with those sold in the white state. Coarse linen yarns are very largely used in the warps of certain classes of carpeting.—*C.*

Black (50 lb. yarn).—Boil 10 pails of decoction of logwood with 2 lb. bluestone and 2 lb. soda ash. When dissolved, cool down to 180° F., enter the yarn dry, and work for twenty minutes. Lift, rinse and dry.—*C.*

Black Linen Sewing Thread.—Wet out in boiling water, and enter in a water at 212° F., made up of 17 oz. solid extract of logwood, and 3½ oz. solid extract of bark. Work for an hour, lift, and hang out in the air for twelve hours. Re-enter in the extract beck, which should be at 88° F, give eight turns and lift. Work for a quarter of an hour in a fresh cold water, with 6¼ oz. bluestone, lift, and dissolve 17 oz. soda ash in the old extract bath. Enter yarns and give ten turns. Lift, return to the bluestone water, seven turns. Take out, return to the extract beck, and give seven more turns.—*C.*

Next dissolve in the bluestone water 7 oz. copperas. Enter yarns, give ten turns, and return to the extract bath for 7 turns. Make up a fresh boiling water with 8¾ oz. curd soap, and give seven turns. Oil or glycerine may be added to the soap beck to insure softness.—*C.*

Black (40 lb.).—Steep for an hour in a solution of 4 lb. extract of logwood. Squeeze well and pass eight times through a cold water with 7½ oz. bichromate and 12 oz. bluestone. Take out and squeeze, and dissolve in the old extract beck 1 lb. soda ash. Enter, heat to 167° F., take out, squeeze again, dissolve in the beck 1 lb. copperas. Work for half an hour, and rinse. To hinder the goods from smearing take through a water containing a little gum.—*C.*

Fast Black (50 lb. yarn.).—Steep overnight in the hot decoction of 15 lb. sumac. In the morning lift and take through a warm water made up with 5 lb. copperas, 1 lb. bluestone, and 2 lb. whiting. Work in a cold, weak limewater, rinse, and return to the sumac cistern, to which must be previously added six pails decoction of logwood, and 1 lb. of starch paste.—*C.*

Dyeing and Finishing Black Linen Sewing Thread (11 lb.).—Wet out in boiling water, and enter in a beck at 212° F., made up of 17¼ oz. solid extract of logwood, and 3½ oz. solid extract of bark. Work for an hour, lift, and hang out in the air for twelve hours. Return now to the extract beck, which should be at about 88° F., give eight turns and take out. Work for a quarter of an hour in a fresh cold beck of 6¼ oz. blue vitriol; take out and dissolve in the old logwood beck 17¼ oz. of soda ash. Enter and give ten turns. Take out, return to the blue vitriol beck, give seven turns. Take out, return to the extract beck, and give seven more turns. Next, dissolve in the blue vitriol beck 7 oz. copperas, enter the yarn, give ten turns, and return to the logwood beck for seven turns. Finally, make up a fresh boiling beck of 8¾ oz. curd soap, and give seven turns. Oil or glycerine may be added to the soap beck to insure softness. After drying, the thread is run over cold rollers, being twisted slowly all the time, that it may be flattened in different directions. It is essential that the thread should not be washed or undergo any other treatment after the soap beck.—*R.*

Blues.—For linen the cold copperas vat, or the improved hydrosulphite vat, may be used exactly as for cotton.

Topped Blues (11 lb.).—1. Give a light blue in the vat, sour, rinse, and add to a cold water 1 oz. tin crystals, and 3 lb. 6 oz. nitrate of iron. Work for 2 hours, lift, make up a fresh cold water with 2¾ to 3¼ lb. logwood and 17 oz. alum. Dry cold for a quarter of an hour and rinse. If the color is not to rub off, take through a lukewarm water with 4½ oz. glue and dye.—*C.*

2. Vat as before, and make up a water with "indigo substitute," a mixture of induline and extract of logwood. Enter, work at 144° F. for thirty minutes, and sadden in a fresh water with 1½ oz. chromate of potash and ¾ oz. bluestone.—*C.*

3. Vat as before, and work for an hour in a water of 11 lb. logwood and 17 oz. alum. Make up a fresh cold water with 2 lb. 3 oz. copperas. Give ten turns, and according to shade give two or three dips in both becks. If not deep enough, add a little nitrate of iron to the logwood. Rinse and take through weak glue water.—*C.*

Blue without Indigo (on 55 lb yarn).—Put the yarn for two or three hours in water with 8¾ oz. copperas, and dry without rinsing. Steep for three hours in a water with 26 oz. alum; wash, wring and dye in a decoction of logwood, to which the solution of 1¾ oz. alum and of the same weight of sugar of lead has been added. Give three turns and the dyeing is complete.—*C.*

Light Blue for Linen (72 yd. 29 in. wide).—Boil the goods for an hour with 2 lb. 3 oz. soda ash, rinse, and give a light blue in the cold vat. Sour with 3¼ lb. sulphuric acid and rinse. For the finishing, prepare a mixture of 108 pt. with 2 lb. 3 oz. wheat starch, and the clear solution of ¾ oz. of gentiana violet B and 8¾ oz. of alum, pass through this at 122° F., and calender. If the color is not required to be quite fast, give a rather paler shade in the vat, and prepare the following finishing: Boil out 11 lb. St, Domingo logwood in water, and dissolve in the clear decoction 17¼ oz. alum. Boil up in the liquor 3¼ lb. starch, let cool, and stir in it 17¼ oz. sulphate of zinc and ¾ oz. tin crystals. With this make up 105 pt., work in it for half an hour, dry and calender. The goods must pass evenly through the mixture, as folds and creases make the color uneven.—*R.*

Light Blue (pieces 62 yd. 29 in. wide).—Boil with 35 oz. soda ash, rinse, and give a light blue in the vat. Sour with 3¼ lb sulphuric acid and rinse. Mix 108 pt. water with 35 oz. wheat starch, and the clear solution of ¾ oz. gentiana violet B, and 8¾ oz. alum. Take through this at 122° F. and calender. If the color need not be quite fast, give a paler shade in the vat, and prepare the following finish: Boil 11 lb. logwood in water, and dissolve in the clear decoction 17 oz. alum. Boil in the liquor 3¼ lb. starch, let cool, and stir in 17 oz. sulphate of zinc, and ¾ oz. tin crystals. Make up 105 pt., work in it for half an hour, dry, and calender. Let the pieces run evenly through the mixture.—*C.*

Aniline Blue (50 lb.).—Dissolve 4 oz. aniline blue in 1 pt. hot methylated spirit, and stir the solution well into a water at 140° F. Stir in also 2 lb. acetic acid, and the solution of 3 lb. sulphate of soda crystals. Enter, raise gradually to about 210° F., turning constantly; lift, rinse and dry.—*C.*

Prussiate Blue (50 lb.).—Add to a water, slightly warm, 3 lb. nitrate of iron, and 2 lb. tin crystals. Enter, and give five turns, pass into a fresh water made up with the solution of 2 lb. yellow prussiate, and 1 lb. oil of vitriol. Lift, drain and re-enter in the iron bath. If not dark enough, take again through the prussiate. Lift, rinse and dry.—*C.*

Another Brown (50 lb.).—Add to a water at 140° F., 5 lb. alum; 5 lb. "aniline spirit," and 10 pails logwood liquor. Work for twenty minutes, rinse, and dry.—*C.*

Catechu Fast Brown (50 lb.).—Steep yarns overnight in the decoction of 10 lb. cutch or gambir. Lift, work in a hot solution of bichromate of potash, lift, rinse, and dry.—*C.*

Madder Brown (50 lb.)—Add to a water 5 lb. boiled madder and 5 lb. alum. Enter yarn at 150° F. Five turns, add 2 lb. double muriate, work fifteen minutes, lift, rinse, and dry.—*C.*

Light Green (10 lb.).—Digest for six hours with 6½ lb. sumac. Wring out and enter for half an hour in the following mordant: Alum, 500 grn.; sugar of lead, 250 grn. Wring out and dye with 100 grn. iodine green.—*C.*

Fast Green (110 lb.).—Boil for four hours in the solution of 4 lb. 6 oz. silicate of soda, blue slightly in the cold vat, take through vitriol sours, wash, take through weak lime water, and wash again. Steep overnight in a water at 167° F. with 3¼ lb. blue vitriol. Wash the next morning, and take through a fresh water at 167° F. with 5¼ lb. fustic, saddening with logwood if needed.—*C.*

Green (50 lb.).—Add to a water 5 lb. alum, 2 lb double muriate, 2 oz. tin crystals, and ¼ lb. flavine. Boil together for ten minutes, cool, enter yarn, work very quickly and then more slowly for twenty minutes. Lift and rinse.

Make up a cold water with a solution of 1 lb. extract of indigo and 6 lb. alum.

Enter yarns, turn quickly at first, and let steep for some hours, turning occasionally. Lift and dry without rinsing.—*C.*

Greenish Gray (22 lb.).—Dissolve 17 oz. soda ash in a water, and boil for an hour. Wash, and take through a fresh water with 17 oz. sulphuric acid, and wash again. Stir up 2 lb. 3 oz. of the best chloride of lime to a uniform paste, and allow to settle. Soak the goods in the clear liquid for six hours, turning occasionally. Lift, and take through a fresh water to which 35 oz. muriatic acid have been added. Rinse well. Boil out 8¼ oz. sumac and 35 oz. bark in sufficient water. Enter the goods for an hour in the clear liquid at 122° F., press, and pass into a fresh water with 8¼ oz. copperas. Work here for fifteen minutes, and take through water. Make up a water at 122° F. with 35 oz. alum; enter the goods, and add by degrees very small quantities solution of bark and extract of indigo till the shade is hit. Rinse and dry.—*C.*

Iron Gray (11 lb.).—Work for an hour in a boiling water with 35 oz. sumac. Wring and work for another hour in a fresh water with the same weight of copperas.—*C.*

Lilac (50 lb.).—Add to a decoction of logwood at a hand heat 4 lb. alum, and 2 lb. double muriate. Work for twenty minutes, lift, rinse and dry.—*C.*

Bluish Mode (11 lb.).—Mordant at 167° F. with 35 oz. sumac, and work in a cold water with 35 oz. copperas. Rinse, and dye up in a fresh water with alum, extract of indigo, and magenta as required.—*C.*

Reddish Mode (11 lb.).—Boil out 7 oz. prepared catechu in water, work the yarn in the solution at 144° F. for half an hour; lift, and work in a water at 180° F. for half an hour, with 3½ oz. chromate of potash. Rinse, and top in a fresh beck with alum, extract of indigo, and magenta.—*C.*

Greenish Mode (11 lb.).—Work for an hour in a water at 167° F. with 35 oz. sumac, and 7 oz. solid extract of fustic. Lift, and work for half an hour in a cold water, with 35 oz. copperas. Make up a fresh water at 167° F. with 3½ oz. solid extract of fustic, 8¾ oz. alum, adding extract of indigo as required, and a very little magenta. Top in this beck.—*C.*

Aniline Orange (on 11 lb. linen yarn.)—Dye as for yellow and top in a fresh water with ¼ oz. saffranine, or rather less.—*C.*

Chrome Orange (11 lb.).—Boil up 3¼ lb. sugar of lead in water with an equal weight litharge till the sediment is white. Let settle, and steep the yarn for an hour in the clear, hot liquid. Lift, and take through a cold water with 17 oz. lime. Rinse slightly and work in a cold water with 17 oz. chromate of potash, and the same weight of sulphuric acid for a quarter of an hour. Redden for three minutes in a boiling water with 8¾ oz. of lime. If a redder shade is needed, top in a fresh cold water with ⅛ oz. magenta.—*C.*

Madder Orange (50 lb.).—Add to a hot water 2 lb. flavine, 10 lb. alum, 6 lb. double muriate, ¼ lb. tin crystals, and 5 lb. madder. Boil for ten minutes, cool to 170° F., enter yarns, turn very rapidly at first and then more slowly for about a quarter of an hour. Lift, rinse, and dry.—*C.*

Annatto Orange (50 lb.).—Boil 1 lb. annatto in 4 lb. soda ash, and add the decoction to a water at 160°. Enter yarn, work to shade, rinse, and dry. This is a bright, but not very fast, orange. —*C.*

Rose on Linen (11 lb.).—Work in a boiling hot beck of 7 oz. tannin and 3½ oz. curd soap; add to the water the solution of 3½ oz. tin crystals, and dye with ⅛ to ¾ oz. saffranine at 110° F.

Reds, Magenta (100 lb.).—Dissolve 3 oz. magenta, and add the solution to a water at 150° F. Stir well, enter, and work for twenty minutes. Lift, and dry without rinsing.—*C.*

Fast Sanders Red (100 lb.).—Ground slightly with annatto; mordant by steeping overnight in bichloride (oxy-muriate) of tin at 11¼° Tw. Rinse, wring, and enter in a beck made up with 5 lb. sanders, and work at a boil for twenty minutes. Take through vitriol sours at ½° Tw., wring, and rinse.—*C.*

Crimson (50 lb.).—Steep in the decoction of 10 lb. sumac. Work well in a water to which 3 lb. of "aniline spirit" have been added. Enter in a water at 140° F., to which has been added the decoction of 15 lb. redwood, working for twenty minutes. Lift, rinse, and dry.—*C.*

Red (11 lb.).—Boil for five hours with ½ lb. soda-ash and 2 lb. 3 oz. lime, rinse and pass into a water containing 8¾ oz. muriatic acid. Rinse again and prepare a bleach by stirring up in cold water 8¾ oz. chloride of lime. The yarn is steeped six to seven hours in the clear liquid. If the yarn appears white, rinse in cold water, take through muriatic sours at ½° Tw., rinse, and work in boiling water containing 17½ oz. tannin. Wring and dry at 167° F. in a fresh water containing 1¾ oz. yellowish saffranine. —*C.*

Rose (on 11 lb. linen yarn).—Work for half an hour at a boil with 7 oz. tannin and 3½ oz. curd soap. Lift, and add to the beck the solution of 3½ oz. tin crystals, and dye at 112° F. with the solution of ⅛ to ¾ oz. aniline red according to shade.—*C.*

Another Red (50 lb.).—Boil together 5 lb. sumac, 5 lb. alum, 2 oz. tin crystals, and 1 lb. flavine. Cool the decoction down to 180° F., enter yarns, work for a quarter of an hour, and lift. Take it without rinsing through a cold water, to which 3 lb. "aniline spirit" has been added. Each lot of yarn is worked in this mordant from about one and a-half minute, and a little more of the spirit is added for each lot. Drain, and make up a water at 125° F. with the decoction of 15 lb. redwood. Turn quickly at first, and afterward more slowly for twenty minutes. It is an improvement to add to the color-bath 2 lb. whiting, in order to neutralize the acid. Lift, rinse well, and dry.—*C.*

Golden Yellow (on 11 lb. linen yarn).—Steep for three hours in a boiling water with 17 oz. tannin, wring out and dye in a fresh cold water with 3½ to 4¼ oz. aniline orange or phosphine. —*C.*

Yellow (100 lb.).—Boil together for fifteen minutes 2 lb. flavine, 10 lb. alum, 8 lb. double muriate, and ¼ lb. tin crystals. Cool to 170 F., enter yarn, and work with the usual precautions to shade. Lift, rinse, and dry.—*C.*

Marble, to Stain or Dye.—1. In staining marble it is necessary to heat it hot, but not so hot as to injure it, the proper heat being that at which the colors nearly boil. Blue is produced with an alkaline indigo dye. Red by dragon's blood in alcohol. Yellow by gamboge in alcohol. Gold color with (sal ammoniac) ammonium chloride, zinc sulphate, and verdigris, equal parts. Green, sap green in alcoholic po-

tassium hydroxide. Brown, tincture of logwood. Crimson by a solution of alkanet root in turpentine. Black spots may be produced with silver nitrate. As a general rule, however, we believe marble tables are made by inlaying rather than by staining.

2. Marble can be stained different colors by the following substances: Blue, solution of litmus; green, wax colored with verdigris; yellow, tincture of gamboge or turmeric; red, tincture of alkanet or dragon's blood; crimson, alkanet in turpentine; flesh, wax tinged with turpentine; brown, tincture of logwood; gold, equal parts of verdigris, sal ammoniac, and sulphate of zinc in fine powder.

Pasteboard, to Dye.—To color white pasteboard the color of leather, soak in solution of copperas and then in ammonia.

Pearl Buttons, to Dye.—Wash with lukewarm solution of potash, then place in a strong aqueous solution of the desired color and let them stand, with frequent stirring, in a warm place. To cause the color to penetrate, an immersion of two weeks may be needed. Use the aniline colors.

Silk Dyeing. — Silk occupies, in several respects, an intermediate position between the truly animal and the vegetable fibers. Like wool, it is a highly nitrogenous body, but contains no sulphur. It takes up very many of the colors which can only be worked upon vegetable fiber by the aid of mordants. It tolerates acids better than cotton, but less fully than wool. Like the latter fiber, it is unable to bear the action of strong alkalies, especially at high temperatures. Like cotton, it can be dyed a Prussian blue by working alternately in a solution of nitrate of iron and in one of prussiate of potash. It has a strong affinity for iron and for tannin. Cochineal does not work as advantageously upon silk as upon wool, and a true "grain scarlet" upon silk can scarcely be said to exist. On the other hand, carthamine and the aniline colors appear here to the greatest advantage. The great attraction of these colors for silk simplifies silk-dyeing exceedingly. Such colors as aniline orange, cyanose rose, rose Bengale, phloxine, the various shades of rosine, magenta, the aniline violets, malachite green, the aniline blues, require merely to be dissolved and mixed with perfectly clear water in a clear pan. A little acetic or tartaric acid is often added, and in case of the azo colors (such as ponceau, grenadine, etc.) a little oil of vitriol.—*C.*

Lyons Black. — The silk is first entered in black liquor at 25° or 30° and washed. Then it is worked in a hot soap lye, and passed hot into a water containing 2% of yellow prussiate of potash, and washed. It is then steeped in the black liquor, washed, and soaked for twelve hours in a saturated decoction of catechu, and washed. It is finally dyed in a bath of logwood, containing 25% of soap.—*C.*

Blue on Silk Garments (17¼ oz.).—Wash and work for a quarter of an hour in a boiling kettle of ⅛ oz. Nicholson blue, and 3½ oz. borax. Lift, drain, and take through a cold beck of 3½ oz. sulphuric acid.—*R.*

Bleu de Lyon. — Clear water with sulphuric acid, and give the silks five or six turns. Add the coloring matter to the beck in several successive portions as the dyeing advances. Begin to dye in the cold, and raise gradually to a boil. Soap, rinse, and give a slight brightening in the cold with sulphuric acid.—*C.*

Soluble Blue.—As Bleu de Lyon, but without soaping.—*C.*

Aniline Blue with Soap (11 lb.)—Add to a water at 165° F., 1 lb. 1 oz. sulphuric acid and 3½ oz. white soap in solution.

Stir up very well and add in four successive portions, 1¾ oz. blue, previously dissolved in water.

Dye, wash, and rinse with sulphuric acid. —*C.*

Peacock Blue.—1. 80 lb. silk. 1 pt. sulphuric acid at 170° Tw., 10 oz. methylin blue crystal dye at 120° to 160° F.—*G.*

2. Peacock Blue.—80 lb. cloth or yarn. 3 oz. biborate of soda (borax), 11 oz. peacock blue crystals. Enter at 140° F., and bring to boil in twenty minutes.—*G.*

Prussiate Blue (40 lb.).—Enter in a water, 60 gal., at 120—130° F., with 9 lb. nitrate of iron at 120° Tw., and 1 lb. 10 oz. tin crystals. Give nine turns, wash, and give nine turns in a warm water with 2 lb. yellow prussiate and 1 lb. oil of vitriol. Return without washing to the first bath, and give nine turns more. Wash, and give nine more turns in the prussiate bath. Add to the first bath 2 lb. nitrate of iron and 10 oz. tin crystals, nine turns and wash. Finally, give nine turns in the prussiate bath, to which 12 oz. prussiate and 1 lb. sulphuric acid have been added. Wring out, and leave for six hours in a covered bowl. Wash, raise, and dry in the air.—*C.*

Brown on Silk.—Steep the ungummed silk overnight in alum-water at 100° F. Take out the next morning, and dye in a water with logwood, redwood, and fustic, as the shade requires. For mediums 20 oz. of each of the three woods suffice for 11 lb. of silk. The beck is kept at from 167° to 194° F., and the goods are turned from thirty to sixty minutes.—*C.*

Light Brown on Silk Garments (17¼ oz.)—Wash for fifteen minutes at 167° F. in a clear beck, made up with 1¾ oz. genuine cutch; lift and enter in a fresh beck at the same heat, with ¾ oz. chromate of potash, and work in this for a quarter of an hour; rinse and dye up at 167° F. with a little vesuvin and magenta. Vesuvin should predominate for yellowish tones, and magenta in red ones.—*R.*

Olive Bronze for Half Silk Yarn.—6 lb. prepared cutch, 3 lb. yellow cutch (*Terra japonica*), and 2 lb. cyprus are boiled together, then the bath cooled down to about 100° Fahr.; the yarn, 50 lb., introduced, turned for three hours, taken out and placed in a fresh hot bath, darkened with 2 lb. bichromate of potash, passed for half an hour into the first bath, with the addition of 4 lb. curcuma and darkened in a fresh cold bath with nitrous iron (nitrate of iron?) up to the required shade.

Corinth Brown on Silk Garments (17¼ oz.).—Make up the kettle with 3½ oz. orchil, 1 oz. turmeric, 1 oz. sulphuric acid, ¾ oz. violet lake, and 1-6 oz. magenta and dye at a boil.—*R.*

Brown on Mixed Silk and Cotton.—Boil ¼ lb. catechu in a water, and make up a beck at 100° F., steep the goods in this for five hours, turning frequently. Lift, wring, and pass into a weak chrome bath at 122° F. Work for half an hour, wash and dry. If the cotton is too light it may be darkened with a decoction of logwood.—*C.*

Brown on Silk Waste.—Dye with extract of orchil, nigrosine, turmeric, soap lye and sulphuric acid. Enter at 112° F., raise to a boil in three turns, wash well, whiz and dry.—*C.*

Chamois on Silk Waste.—Dye with the same wares as yellow at 122°—132° F.—*C.*

Green on Silk Waste.—Prepare with a solution of silicate of soda at 167° F., using 8¾ oz. silicate of soda to every 2 lb. 3 oz. of silk. Drain and whiz without wringing. Then boil with 3½ to 5½ oz. neutral soap. For methyl-green and iodine-green the silk is steeped with a solution of the color and a very little soap lye at 100° F. Raise the heat very gradually to 144° F., wash and finish in lukewarm beck with picric acid and very little tartaric acid. Dark green may be produced with a soluble aniline blue, turmeric, sulphuric acid, and old soap lye. Enter at 110° F., and raise in three turns to a boil. Wash and finish with acetic and picric acids. It is well to dye the green too much on the blue side, and afterward dye to shade with picric acid. Turmeric alone gives too flat a shade. —*C.*

Iron Gray on Silk Thread (11 lb.)—After boiling wash well twice, and mordant twice with iron. For light shades take 17 oz. oil of vitriol and 34 oz. nitrite of iron, for mediums 4 lb. 6 oz. nitrate of iron, and for heavy shades 8¾ lb. Pass the silk through the back from seven to nine times, and wash twice; dye at 112° F. in a water made up of logwood, redwood, and fustic, and finally finish off in a fresh beck at 122° F. and wash.—*C.*

Iron Gray on Silk Yarn (11 lb.).—After ungumming, the silk is well washed twice and mordanted cold, with 2 lb. 3 oz. nitrate of iron and 17¼ oz. sulphuric acid for light shades. For mediums, 4 lb. 6 oz. nitrate of iron may be taken, and for darker shades 8¾ lb. Give the silk seven to nine turns in the iron and wash twice. Then dye with a mixture of logwood, peachwood and fustic, according to pattern, at 110° Fahr. Wash once.

Silver Gray on Silk Garments (17¼ oz.).—Make up a beck with 3½ oz. alum, and add solution of indulin and magenta, as may be needed. Enter the goods and dye at boil.—*R.*

Gray (5 lb. silk).—Add to 2 quarts ammoniacal cochineal at 3° Tw., 1 oz. tartaric and citric acid, ½ oz. extract of indigo, and ¼ oz. picric acid. Dissolve well before entering the silk and dye to shade.—*C.*

Pansy for Silk Garments (17¼ oz.).—Dye at 167° F., having first washed the articles well in a beck of 4½ oz. curd soap and solution of aniline violet more or less according to shade.—*R.*

Ponceau on Silk (20 lb.).—Boil for two hours with 5 lb. curd soap; enter dye bath at 120° F., containing enough of the soap lye to lather freely, along with ½ lb. oil of vitriol and 2½ oz. coccinine (Farbwerke, Hoechst). The color is dissolved separately and added in three different portions, while the heat is raised to a boil, turning to shade. Wash and take through a water with acetic acid.—*C.*

Magenta.—Clear the dye-bath with tartaric acid. Pour in the solution of the coloring matter, and dye in the cold. If a more violet tone is needed, ground with a Hofmann's violet, according to the shade required, and top with magenta.—*C.*

Saffranine Rose on Silk.—The silk is prepared as for white, stoved, rinsed, and washed twice in boiling soap lye. A fresh water at 122° F. is made up with the needful quantity of saffranine, and soured with a fresh solution of tartaric acid. In this the silk is dyed to shade.

Poppy Red.—Make up a cochineal liquor at 4° Tw., and for every 5 lb. cochineal thus extracted, use 12 fl. oz. of the tin spirit given below, and dye. Lift, and leave the silk covered for twelve hours, wash slightly, take through citric acid and dry. The tin spirit is made with 4 lb. muriatic acid, 2 lb. aquafortis, and 3¼ oz. tin, added by degrees.—*C.*

Another Poppy Red.—Prepare the silk first in a so called stannate of soda, as given below; take through vitriol sours, wash well, and pass into a solution of red liquor at 8° Tw., thickened with 1 lb. British gum per gal. Dry and air for twenty-four hours, wash well, dye in decoction of cochineal and raise with nitrate of tin. The so-called stannate of soda is made by adding 7 lb. perchloride of tin to 3 gal. caustic soda at 35° Tw., to which is then added 1 lb. oxalic acid dissolved in 1 gal. water. Set at 4° Tw., and use it in the cold. To make the red liquor, dissolve 1 lb. alum in 2 qt. water. Precipitate the alumina by adding 1 lb. soda crystals dissolved in 1 qt. water. Collect the precipitate and dissolve it in 1 qt. strong acetic acid.—*C.*

Campobello Yellow on Silk.—Dissolve in water, enter the silk, and dye to shade at 122° to 140° F.—*C.*

Yellow on Silk Waste.—Dye at 110°—132° F. with aniline golden yellow, picric acid, a little aniline orange and tartaric acid.—*C.*

Washing Silks for Redyeing.—Brush well, and lay the pieces of the dress on a table covered with clean paper. Mix 3½ oz. ox gall and the same weight of ammonia in 9 oz. warm water, and apply it with a sponge on both sides. Roll the silk while still damp on a wooden roller, avoiding all creases. Merino and woolen stuffs may be similarly treated.—*R.*

Skins, to Dye.—It has been complained that fine skins dyed with aniline colors lose their proper tint, and, in order to prevent this, Dr. Reimann proposes the three following methods:

1. In 2 liters of water dissolve 180 grm. of gum arabic, stir the solution well, and rub the dyed skin with it.

2. In 2 liters of alcohol at 96° dissolve 180 grn. of shellac in a bain-marie; rub the dyed leather with this solution, taking care not to use the same brush for two different colors.

3. Add 120 grn. of liquid ammonia to 2 liters of water heated to 75° centigrade, and then dissolve in the solution 90 grn. of cassine; stir the mixture till the boiling point is reached; then decant, and with the clarified mixture rub the dry dyed skin as before, and let it dry again.

In order to render the skin supple after dyeing, mix 10 grm. of yelk of egg and 5 grn. of glycerine in a liter of water; rub the skin with this mixture, let it half dry, and then rub it well with a piece of woolen rag only.

Straw Hats, Bleaching and Dyeing.—Put the straw hats into a pan of boiling water and let them steep overnight. The next morning make up a strong soap beck and brush them well therein. Put them in the stove without rinsing for twenty-four hours, then rinse and dry.

Straw, to Dye.—1. Black. In order to obtain a level color, a solution of gluten is added to a lye of soda, which is allowed to stand for twenty-four hours and filtered. The hats are then steeped for twelve hours in the clear liquid. The straw is thus freed from grease, and the mordants of nitrate, sulphate, or acetate of iron, as well as the decoction of logwood mixed with sumac or galls, is very evenly taken up by the fiber. A slight addition of bichromate of potash improves the tone of the dye, and the goods are finished with gum or gelatine.—*Baden Gewerbezeitung.*

2. For 11 lb. of hats: Copperas, 2 lb. 3 oz.; red argol, 1 lb. 1½ oz.; bluestone, 17¼ oz.

If possible steep the hats overnight in an old black dye beck, and dye up the next morning in a fresh water with about 4 lb. 6 oz. good logwood and a little turmeric.

The hats thus dyed appear at first rather brownish, but they assume a fine black luster on brushing.

Black on Straw Hats.—The hats are first steeped in a beck of soda at 5° Baumé at the heat of 122° F., for three hours, rinsed, and soaked overnight in a sumac beck, containing 2¼ lb. sumac per 5 hats. In the morning take out and drain and soak for three hours in a cold beck of black liquor at 2° B. Take out, drain, and lay the hats separately to air for six hours; rinse and dye at 144° F., with 2¼ lb. logwood per 11 lb. of hats till the shade is reached. Lift, drain, dip singly in a lukewarm beck containing 8¾ oz. glue per 17 pt. of water; dry and rub with a hard brush.—*R.*

Blue Linings for Hats.—In producing these the cloth is not dyed, but the thickened color is applied to it in the following manner: Prepare the color with 22 gal. of water, 30 lb. starch, 2 lb. tallow, 44 lb. ultramarine blue; mix, boil, pass through sieve; print on the roller first on one side, then on the other, and dry on the cylinder.

Catechu Brown.—For 11 lb. of hats: Boil with sulphate of alumina, 17¼ oz.; bisulphate of soda, 8¾ oz.; oil of vitriol, 4⅜ oz. Add to the bath orchil, indigo, carmine, and turmeric, according to shade, and boil.—*Teinturier Pratique.*

Brown on Straw (11 lb.).—1. Boil for two hours with 4 lb. 6 oz. fustic, 3¼ lb. orchil, 1¾ oz. argol, and the same weight of logwood.

2. Boil for an hour in the solution of 3¼ lb. catechu, drain and work in a fresh beck made up of 2 lb. 3 oz. copperas, and rinse.—*R.*

Iron Gray (for 11 lb. of hats).—Steep in a decoction of sumac and dye cold in a beck made up with benzoline and a little acetic acid. There are three sorts of benzoline, so that the tone of the gray may be varied at will. These benzoline grays are much brighter than those obtained with the old processes.

Aniline Green.—Straw is placed in boiling water, then well washed with cold water and bleached in a bath containing 20 gr. bleaching powder to 7 or 9 gr. sulphuric acid. It is then thoroughly washed and mordanted with sumac, alum and tartaric acid (not too dilute a liquor). Finally, it is dyed with aniline green and picric acid until the required shade is obtained, after digesting for some time.—*Muster-Zeitung.*

Magenta Red.—The first operation for dyeing this or any other color on straw is to steep the latter in a bath acidulated with sulphuric acid for twelve hours. For magenta, take an acid bath of 4° to 5° Bé. The straw, after washing, is immersed for twelve hours in a bath kept at 30° to 40° C., containing the necessary amount of dye. Now wash well and dry. Other aniline colors do not dye straw with the same facility.

Maroon, with Logwood.—Clean the straw by boiling with a solution of carbonate of soda, then steep in a bath of logwood for two hours. To give a bluish tint, add some blue stone to the bath; if too much of the latter is used the straw will have a greenish hue. This is a loose color, only employed on account of its cheapness.

Yellow.—To produce the yellow shade which is in such demand, give them a bath with a little picric acid, soured with a little oil of vitriol, and let them dry on the block. For a gloss rinse in gum arabic water or water in which gelatine has been soaked.

Wool Dyeing.—Under this head we include not merely wool, but alpaca, goats' hair, and other true animal fibers, and also the treatment of mixed goods, in which the warp is of cotton, linen, jute, etc., and the weft of wool. Wool is dyed both loose or in the unmanufactured state, in yarns, in piece goods, and in rags or shoddy, and in each of these conditions it requires certain modifications of treatment. Wool is, with few special exceptions, dyed at a boiling heat. It bears contact with acids much better than does cotton, but it is more readily affected by alkalies, especially at high temperatures. Superheated steam also reduces it to a jelly. The mordants used in wool dyeing are very frequently added to the dye pan along with the dye wares and the goods to be dyed, and all are boiled together—a procedure rarely admissible with cotton. Considerable care is needed in order to obtain level shades on woolen yarns, and still more so upon piece goods. For this purpose the articles to be dyed are very frequently entered into the dye liquor at a temperature considerably below the boiling point; they are turned at first with considerable rapidity, and—especially in the case of the aniline dyes—the color is added in successive portions.—*C.*

Blacks.—Aniline Black on Wool (2 lb.).—Dissolve 3 oz. permanganate and 4½ oz. Epsom in 5 gal. hot water. When cool enter the wool and let soak till the liquid retains merely a slight yellow color. Press, and without washing enter in 2 gal. cold water made up with 12 oz. aniline oil and 20 oz. muriatic acid. Press the wool, and wash in a very weak solution of carbonate of soda. Pass into a solution of ⅛ oz. bichromate potash in 2½ gal. water, when it takes a deep black. Wash, and dry.—*C.*

Blue Black on Loose Wool (480 lb.).—Give a medium blue ground in the vat, air, wash, and boil the wool for two hours with 30 lb. logwood 50 lb. sanders, 5 lb. fustic, and 2 lb. red argol. Sadden in the same beck with 7 lb. copperas.—*C.*

Full Blue Black for Piece Goods (27 lb.).—Make up a water with 2 lb. 2 oz. argol, 6¼ oz. chromate of potash, 3½ oz. bluestone, and the same weight of oil of vitriol. Enter at a hand heat, raise to a boil, and work at that heat for an hour. Lift, rinse and dry with 24 lb. logwood and 3¼ oz. oil of vitriol. Wince for three-quarters of an hour in the boiling liquid, lift, rinse, and dry. If not blue enough, cool the beck, add 17 oz. ammonia, stir up, re-enter, and wince for fifteen minutes.—*C.*

Deep Black on Piece Goods (110 lb.).—Boil for an hour and a half with 2¾ lb. chromate of potash, 3¼ lb. red argol, and ½ lb. bluestone. Let cool in the flot, and dye for one hour at a boil with 44 lb. logwood and 13 lb. catechu. Lift, add 26 oz. bluestone, cool, re-enter, and boil for fifteen minutes longer.—*C.*

Chrome Black on Wool (55 lb.).—Boil for an hour and a half with 17 oz. chromate of potash, the same weight of bluestone, and of oil of vitriol. Lift, and dye in a fresh water with 22 lb. logwood and 4¼ lb. fustic, boiling for an hour.—*C.*

Fast Black on Yarns and Cloth (22 lb.).—Boil for an hour with 9¾ oz. chromate of potash, the same weight of bluestone and 8 oz. oil of vitriol. Let grow cold in the dye liquor. Dye in a fresh water with 9¾ lb. logwood, 2¼ lb. fustic and 4½ oz. sulphate of zinc. Boil for an hour, lift, cool, rinse and dry. If a very blue shade is required, leave out the fustic.—*C.*

Black on Wool for Fulling (110 lb.).—Boil for two hours with logwood, 43 lb.; fustic, 15½ lb.; sumac, 13 lb.; red argol, 5½ lb. Replace the water lost by evaporation and sprinkle the wool with a solution of 5½ lb. copperas and 3¼ lb. bluestone, and boil for one hour. For a blue-black sprinkle the wool, when lukewarm, with 4 lb. 6 oz. of ammonia. For deep jet black sprinkle with 3¼ lb. bichromate of potash, dissolved in boiling water, and boil for a quarter of an hour.—*C.*

Black on Knitting Yarns (55 lb.).—Boil for forty-five minutes with 30 oz. chromate of potash, 3½ oz. bluestone, the same weight of argol and 7 oz. sulphuric acid. Take through water and dye at a boil for forty-five minutes with 33 lb. logwood.—*C.*

Black on Wool (160 lb.).—Boil for one hour and three-quarters with 4 lb. bichromate of potash, 3 lb. bluestone, ½ lb. muriate of tin, ¼ lb. oil of vitriol and 10 lb. fustic. Dye in a fresh water with 50 lb. logwood, entering at 170° F., and boiling for one hour.—*C.*

Another Black on Wool (100 lb.).—Boil for one hour and a half with 2½ lb. of bichromate of potash and 1 lb. argol. Dye in a fresh water with the decoction of 30 lb. logwood, 10 lb. fustic, 3 lb. argol and ¼ lb. oil of vitriol. Enter at 170° F. and boil for one hour.—*C.*

Another Black on Wool (100 lb.).—Prepare for two hours at a boil with 8 lb. copperas, 3 lb. bluestone, 3 lb. argol and 10 lb. fustic. Dye in a fresh water with the decoction of 30 lb. logwood, entering at 170° F. and boiling for one hour.—*C.*

Alizarine Black on Wool (100 lb.).—Prepare with 12 lb. copperas, 4 lb. bluestone and 4 lb. red argol, boiling for one hour and a half. Dye in a fresh water with 7 lb. alizarine, 44 lb. logwood, 6 lb. fustic, 6 lb. sumac, 3 lb. chalk.—*C.*

Black on Thick Half Woolen (10 lb.).—Dye in the clear decoction of 3 lb. logwood, ½ lb. sumac and ½ lb. fustic. Raise to a boil and keep up for half an hour. Lift and pass into a cold water with ½ lb. copperas, letting it steep for an hour. Pass into a boiling bath of 2 to 3 oz. yellow prussiate and work for an hour. Repeat all these three baths and rinse well. It is better to rinse each time after the logwood bath.—*C.*

Black on Merino (16 lb. 6 oz.).—Make up a beck with 3½ oz. chromate of potash, 1¾ oz. blue vitriol, 8¾ oz. argol and 6¼ oz. sulphuric

acid. Boil up, cool down and enter the goods previously washed and rinsed. Boil for three-quarters of an hour, lift, take through water and dye at a boil for three-quarters of an hour in a fresh beck made up with 22 lb. St. Domingo logwood, with the addition of 6¼ oz. sulphuric acid. If a bluish shade is desired, cool and add 17¼ oz. ammonia. Rinse and dry. To finish, take the pieces through 17¼ oz. gum tragacanth, dissolve in 70 qt. water.—*R.*

Black on Wool from Alizarine Colors. A: Red Shade Black.—For 100 lb. wool. Mordant by boiling from two to two and a-half hours in a bath containing bichromate of potash, 3 lb.; tartar, 2½ lb. Dye in a bath containing alizarine blue WX, 32¼ lb., cœruleine W, ¼ lb., alizarine orange W, 3 lb. ¼ oz.

B: Reddish Shade.—Mordant as before. Dye with alizarine blue WX, 32¼ lb., cœruleine W, 1½ lb., alizarine orange, 2½ lb.

C: Blue Black.—Mordant as before. Dye in a bath containing alizarine blue WX, 36½ lb., cœruleine W, 1½ lb., alizarine orange W, 1½ lb. Enter the wool in the cold, work for half hour, then gradually raise to boil and dye boiling for 1½ hours. Then lift, wash and dry.—*Textile Mercury.*

Blue Black.—Blue black on 100 lb. loose wool. Mordant for one hour at boil in a bath containing 2½% bichromate of potash, 2½% red argols. Wash off and dye for one hour in a boiling bath of 8 lb. extract logwood, 51°. Pole well, lift out, let drain, and sadden with 2 lb. copperas. Enter and pole for one half hour. Lift out and wash.

Black on Woolen Knitting Yarns (55 lb.).—Boil for forty-five minutes with 30¼ oz. chromate of potash, 3½ oz. bluestone, the same weight argol, and 7 oz. sulphuric acid. Take through water, and dye at a boil for three-quarters of an hour with 33 lb. logwood.—*R.*

Black on Woolen Piece Goods (110 lb.).—Boil for ninety minutes with 8¾ lb. copperas, 4 lb. 6 oz. bluestone, the same weight of argol, and 11 lb. fustic. Dye afterward with 44 lb. logwood.—*R.*

Fast Black on Woolen Yarn (11 lb.).—Boil for one hour with 4½ oz. chromate of potash and the same weight of prepared tartar finely ground; rinse immediately, and let cool in the liquor, and dye with 6½ lb. logwood, adding a little fustic according to shade, and 7 oz. logwood. Boil for three-quarters of an hour. After dyeing drain and take the yarns four times through the prepared beck; rinse, and then take three times through an old soda-beck. Rinse when the dyeing is complete.—*R.*

Black on Woolen Knitting Yarns (55 lb.).—Boil for forty-five minutes with 30¼ oz. chromate of potash, 3½ oz. bluestone, the same weight argol, and 7 oz. sulphuric acid. Take through water, and dye at a boil for three-quarters of an hour with 33 lb. logwood.—*R.*

1. Superior Jet Black.—5 pieces = 100 lb. cloth; dyeing vessel containing about 150 gal. hot water, in which dissolve 3 lb. bichromate of potash; work in this at boil for one hour, afterward wash in cold water. Then in same vessel again charged with 150 gal. hot water, add 34 lb. ground logwood and 7 lb. fustic, ground or chipped; enter just below boiling, and immediately raise to boil, and work in it for one hour and twenty minutes. Wash in cold water and dry.—*G.*

2. Black for Alpaca Yarns containing 30% of Cotton (55 lb.).—For the mordant, take as little cold water as practicable and add black liquor till it makes 5½° Tw., and the following substances, which are dissolved separately, each in a small quantity of water, and to the solutions are added: Sugar of lead, 17 oz.; crude red potash, 17 oz.; copperas, 4 lb. 6 oz.; chromate of potash, 17 oz.; sal ammoniac, 7 oz. Let the mixture settle well, and steep the yarns in the clear for one hour and a half. Lift, whiz, dry rapidly, take through a weak soda bath, and dye in a fresh water with logwood, 17½ lb.; fustic, 4 lb. 6 oz.—*C.*

Black for Mixed Goods (100 lb.).—Boil 40 lb. logwood, 10 lb. fustic, 20 lb. sumac, 3 lb. red argol. Cool, enter, and boil for an hour. Lift, and add 6 lb. copperas and 4 lb. bluestone. Boil again for an hour; lift, cool down, and tone in the same water with 5 lb. ammonia and 2 lb. soda ash.—*C.*

Blues, Logwood Blue (100 lb.).—Give a ground in the vat, wash, and mordant at a boil for one hour and a half with 8 lb. alum, 5 lb. sulphate of copper, 6 lb. tin crystals, 4 lb. bichromate of potash, 2 lb. argol and 2 lb. sulphuric acid. Dye in a fresh water with 20 lb. logwood and 4 lb. Santa Marta wood, without bringing to a boil.—*C.*

Logwood Blue Process in use at Aix la Chapelle (100 lb.).—Boil for two hours with 13 lb. alum, 6½ lb. argol, 2½ lb. tin crystals and ½ lb. sulphuric acid. Let the wood lie for a night, and then dye with 40 lb. logwood and 1 lb. carbonate of soda crystals.—*C.*

Logwood Blue Process in use at Verviers (100 lb.).—Boil for two hours with 10 lb. alum and 1 lb. bichromate of potash. After boiling, let the wool lie overnight and dye in the morning with 20 lb. logwood.—*C.*

Logwood Blue, Dutch Process (100 lb.).—Boil for two hours and a half with 5 lb. sulphate of alumina, 4 lb. chrome alum, and 1 lb. bluestone. Let lie overnight and dye the next morning with 6 lb. extract of logwood and 1 lb. carbonate of soda.—*C.*

Dark Blue on Cloth (110 lb.).—Boil for an hour with 5½ lb. alum, 2¾ lb. red argol, 17 lb. chromate of potash and 2¾ lb. bichloride of tin. Let cool in the flot. Dye for one hour at a boil with 22 lb. logwood and 11 lb. extract of indigo.—*C.*

Extract Blue on Wool and Cloth (55 lb.).—Make up a water with 17 oz. sulphate of soda, the same weight of oil of vitriol, and from 7 to 17 oz. extract of indigo. Boil up, cool, enter, then turn continually to shade at a boil.—*C.*

Nicholson Blue (50 lb.).—Make up a water with 1 lb. borax and 7 oz. Nicholson blue. Enter at 170° F., give four to five turns, and raise to a boil, turning to shade. Wash, and raise color in a water acidulated with sulphuric acid. Wash and dry.—*C.*

Methylene Blue (100 lb. Wool).—Mordant for one hour and a half with 2½ lb. bichromate of potash and 2 lb. argol, at a boil. Dye in a fresh water with 1 lb. methylene blue O O (of the Baden Aniline Company), boiling for three-quarters of an hour and letting the wool afterward steep in the hot liquor for four to eight hours. This shade stands fulling.—*C.*

Blue on Wool and Cloth (44 lb.).—Boil for an hour with 5½ lb. alum, 5½ lb. argol, 1 lb. oxalic acid, ½ lb. tin crystals. Dye in a fresh beck with 6½ to 11 lb. logwood.—*C.*

Nemours Blue on Cloth (11 lb.).—Boil for one hour and a half with 4½ oz. chromate of potash, ¾ to 1¼ oz. oil of vitriol, and 8¾ oz. argol. Let cool in the liquor, rinse and dye with 4½ to 5½ lb. logwood, 1 lb. sanders and ¼ lb. fustic, boiling for an hour.—*C.*

Aniline Blue on Yarns to bear Fulling (55 lb.).—Make up a water for 5½ lb. sulphate of alumina, 4¼ lb. sulphate of soda, 26½ oz. tartar, 17 oz. perchloride of tin and the clear solution of 3 oz. aniline blue. Boil up, enter the yarns, and dye at a boil. Take out, whiz and rinse.—C.

Guernsey Blue on Flannel (100 lb.).—Boil up 30 lb. barwood, cool, enter the flannel, and boil for three-quarters of an hour. Then dissolve in a water 2 lb. Guernsey blue and 1½ lb. sulphate of zinc. Enter the flannel at a hand-heat, raise slowly to a boil, and boil for two hours. Lift, rinse well in cold water and raise the shade in a bath containing 1½ lb. sulphate of zinc and 8 lb. oil of vitrol. Rinse and dry.—C.

Prussiate Blue on Worsteds (100 lb.).—Dissolve in separate vessels and in cold water: 9 lb. red

prussiate, 2½ lb. tartaric acid, 2½ lb. oxalic acid and 2 lb. tin composition. When well dissolved pour together and stir well. Add the above mixture to a water at 100° F., and then add 12 lb. good oil of vitriol. Enter the goods, turn well, heat slow up to the boiling point and boil for half an hour. For darker shades add the decoction of 14 lb. logwood chips and a few pounds of muriate of tin. Cool the dye before re-entering the goods and turn very quickly to get a level shade. For a finer shade leave out the logwood, rinse well, and top in a fresh cold bath with a little aniline blue.—*C.*

Scotch Blue on Worsted—One Bath (50 lb. worsted).—Dissoive 10 lb. Glauber salts, 5 lb. alum, ¼ lb. red tartar, ⅛ gal. sulphuric acid, 20 lb. indigo paste (medium quality), 3 lb. orchil carmine (Pickhardt & Kuttroff). Enter the yarn at 180° F., give eight turns, bring to boiling, then give about six turns, whiz well and dry.

Note 1. To get the shade even it is advisable to begin with 15 lb. indigo paste and 2½ lb. orchil, add balance when boiling.

2. In using common or medium indigo paste, it is advisable to add sulphuric acid after dissolving all other drugs, then skim the liquor from the impurities which rise to the top.

3. Should the shade turn to red, 1 pt. sulphuric acid will reduce the same. ¼ oz. methyl purple, or a finer quality of indigo paste, will produce more brightness of color.

Fast Blue without Indigo (120 lb.).—Boil for two hours with 3 lb. bluestone, 3 lb. oxalate of potash, 15 lb. alum, 6 lb. argol and 2 lb. chrome. Let cool in the flot, and dye in a fresh water with 50 lb. logwood, boiling for two hours.—*C.*

Dark Gendarme Blue on Worsted (50 lb.).—Add to a water 1 lb. borax, 3 oz. Nicholson blue, and 6 oz. alkali green (Meister, Lucius & Bruening, of Hoechst). Enter at 160° F., turn for ten minutes while raising to a boil, and boil for half an hour. Enter in a fresh water at 130° F., with ¾ lb. oil of vitriol. Give four or five turns, and wash.—*C.*

Dark Navy Blue on Worsted (50 lb.).—Dissolve 10 lb. sulphate of soda, 2 lb. induline, 2 lb. extract of orchil, and 6 lb. extract of indigo, and add 2 qt. oil of vitriol. Enter at 180° F., turn continually, raising to a boil, and boil to shade.

Dark Sapphire on Worsted (50 lb.).—Give a Guernsey blue bottom in the usual manner, with 6 oz. Guernsey blue; wash and raise in a water with 2 lb. sulphuric acid. Dissolve in a fresh water 3 lb. sulphate of soda, ½ lb. argol, 1 lb. alum, 3 lb. indigo extract, and 1½ lb. picric acid.—*C.*

Blue on Yarn (100 lb.).—Make up water at 160° F., with 10 lb. sulphate of soda, 2 lb. oil of vitriol, 1 lb. "soluble blue R. S." (Monnet & Co., Geneva). Enter, turn to shade while raising to a boil; wash and dry.—*C.*

Blue on Coarse Wooled Yarns (55 lb.).—Indigotine for dark colors (Frankel & Runge, of Berlin), 10¼ oz.; orange (Badin Anilin Co.), 1¼ oz.; methyl violet, ¼ oz. Dissolve well, and add to the water. Add further: Oil of vitriol, 2 lb. 3 oz.; sulphate of soda, 5½ lb.; red argol, 8¾ oz. Enter yarns at 122° F., and boil for an hour.—*C.*

Benzyl Blue.—Dissolve in 100 to 200 parts water, and dye at a boil without any mordant.—*C.*

Fast and Bright Brown (220 lb. Woolen Cloth).—Take 6½ lb. argol, fustic, sanders, madder, logwood, and sumac to shade. Boil for an hour and a half, and sadden with bluestone, and lastly with copperas. For a brighter shade to the same weight of goods, take 5½ lb. chromate of potash, 3¼ lb. each of argol and sulphuric acid; boil for two hours, and dye with fustic, sanders, madder, and logwood, and sadden with copperas.

Navy Blue for Ladies' Cloth (44 lb.).—First bath 4 lb. soda and ¾ lb. Prussian blue, in which the cloth is turned for an hour at 200° F.; it is then washed and placed in a second water, strongly soured, and containing 10 oz. methyl violet. Finish below the boiling heat.—*C.*

Marine Blue on Mixed Goods (22 lb.).—Give a ground with Nicholson blue, working for half an hour at a boil, with 4½ oz. Nicholson blue of the reddest shade and 8½ oz. soda crystals. Rinse slightly and raise in a fresh hot water with 10½ oz. oil of vitriol, and bring up to shade in the same water with a little orchil liquor and picric acid. After the wool or worsted has thus been dyed, the goods are steeped overnight in a lukewarm solution of 3½ oz. tannin, and then worked for half an hour in a cold solution of aquafortis at 1½° Tw. Dye to shade with bluish methyl violet and a little extract of logwood, souring lastly with a little vitriol.—*C.*

Blue.—Blue on 200 lb. blanket yarn—half cotton and half wool. Dyed separately, then mixed and spun. The cotton is dyed as follows—100 lb. raw cotton: 3 lb. benzo-azurine, 3 lb. refined alkali, 10 lb. Glauber's salt. Boil in the stock, and boil slowly for one hour.

Wool is dyed as follows—100 lb. raw wool: Boil up 1¼ lb. Guernsey blue, 4 lb. oil of vitriol, 8 lb. Glauber's salt. Enter wool at 160° F., raise to boil, and work at boil for one hour. Draw off and wash.

Blue on Camel's Hair.—Blue on 100 lb. camel's hair: ½ lb. alkali blue, B, ¾ lb. Guernsey blue, 4 lb. oil of vitriol, 8 lb. Glauber's salt. Boil in the stock, pole well, and boil gently for one hour. Draw off and wash.

Dark Blue on Woolen Rep (22 lb.).—Dye at a boil with alum, 17 oz.; argol, 7 oz.; and the necessary quantity of extract of indigo. When the shade is almost reached, top with a little orchil liquor and a few drops of sulphuric acid.

Lavender Blue on Wool (110 lb.).—Boil for an hour with 2 lb. 3 oz. logwood, 4½ oz. extract of indigo, 17¼ oz. orchil, 4½ oz. alum, and the same weight of copperas.—*R.*

Deep Blue on Woolen Piece Goods (110 lb.).—Boil for an hour with 5 lb. 7 oz. alum, 2¾ lb. argol, 17¼ oz. chromate of potash, and 3¼ lb. perchloride of tin. Let cool in the liquor, and then dye at a boil for one hour, with 22 lb. logwood and 11 lb. extract of indigo.—*R.*

Extract Blue for Wool and Woolen Piece Goods (55 lb.).—Make up the beck with 17¼ oz. sulphate of soda, the same weight of sulphuric acid, and from 7 to 17¼ oz. indigo, carmine according to shade. Boil up, cool and enter, boiling with continual turning till the shade is obtained.—*R.*

New Blue on Flannel.—Red prussiate, 8%, sulphuric acid, 8%. Enter at a hand heat and raise gradually to a boil, which is kept up for half an hour, and cool. Take out and add to the beck a strained solution of about ¼% of the new "acid magenta" and the same weight salt of tin, and dye for another half hour. It is well before adding the magenta to take out a part of the flot, and make up with cold water. If several successive lots are to be dyed in the same bath the proportion of sulphuric acid and of magenta may be lessened after the first lot.

Puteaux Blue on Woolen Cloth or Yarns (100 lb.).—The dyeing is done in wooden or stone tanks, the use of copper being entirely avoided. Steam is introduced by a leaden pipe. Put into the water 3 lb. oxalic acid, and boil for fifteen minutes. Stop boiling, and add 4 to 5 lb. ammonia and 10 lb. dye. Re-enter the goods, and boil for three-quarters of an hour; the bath should then be of a light violet; add 3 to 4 lb. oxalic acid, and dye in an hour and a half. The dyeing can be hastened by adding 1 to 2 lb. more oxalic or acetic acid. After dyeing immerse the goods in water and steep for fifteen minutes in a water at 122° F., containing 4 lb. acetate, sulphate, or chloride of zinc, with 2 lb. acetic, sulphuric, or muriatic acid. Wash as usual. If the wool is to be fulled after dyeing, instead of the zinc process boil it for ten or twenty minutes with 3 to 4 lb. ground galls and 1 to 2 lb. acetic acid.—*C.*

Navy Blue on Mixed Goods (10 lb.).—Boil with 3 oz. each argol and chromate of potash. Rinse,

prepare with 2 lb. sumac, and dye at a gentle boil with 1 lb. logwood and ¼ oz. aniline violet. Lift and work at a hand-heat for half an hour in a water with 2 lb. logwood. Lift, drain, and sadden in a fresh water with ½ lb. bluestone. Lift, and rinse well. Or, prepare with 2 lb. sumac, drain, take through black liquor at 2½° Tw., rinse, and finally dye at a hand-heat with 2½ oz. methyl violet.—*C.*

Dark Chocolate, Cloth or Yarn (80 lb.).—80 to 100 gal. water, 3 lb. bichromate of potash, 15 lb. peachwood ground, 3½ lb. logwood ground, 1½ lb. tartrate of potash. Boil thirty to forty minutes.—*G.*

Dark Olive Brown on Wool.—For 100 lb. wool. Dye in a bath at the boil for one and a half hours with fustic, 55 lb.; logwood, 10 oz.; sumac, 1¼ lb.; cloth red B, 6 oz.; fast brown G, ½ lb.; fast yellow, 1 oz. Darken in a bath of bluestone, 4 lb.; copperas, 2½ lb., for ten minutes; wash and dry.

Bronze on Cloth (45 lb.).—Boil for one hour and a half with 5½ lb. alum, 2¾ lb. argol, and the same weight of bluestone. Lift, and dye at a boil for one hour in a fresh beck, with 32 lb. fustic, 2¾ lb. logwood, and 13¾ lb. madder. Take out and sadden with 3¼ lb. copperas, or more, according to shade.—*C.*

Light Brown on Yarn (110 lb.).—Boil for one hour and a half with 27 oz. chromate of potash, 17 oz. argol, and 14 oz. alum. Dye at a boil for an hour with 35 lb. fustic, 8½ lb. camwood, and ½ lb. madder.—*C.*

Brown on Yarn (110 lb.).—Boil for one hour and a half with 27 oz. chromate of potash, and an equal weight of argol. Lift, and dye at a boil with 44 lb. fustic, 35 lb. camwood, and 11 lb. logwood.—*C.*

Dark Brown (54 lb.).—Give a rather full ground in the vat, and boil for two hours in a water with alum, 22 lb.; argol, 6½ lb.; copperas, 26 oz., and fustic, 17 lb. Lift, cool, and dye hot, but not boiling, with 66 lb. logwood and 13 lb. sumac. At the end of an hour add 4¼ lb. copperas. Wash in water containing a little soda, and lastly, in pure water.—*C.*

Fast and Bright Brown (220 lb. woolen cloth).—Take 6½ lb. argol, fustic, sanders, madder, logwood, and sumac to shade. Boil for one and a half hours, and sadden with bluestone, and lastly with copperas. For a brighter shade to the same weight of goods, take 5½ lb. chromate of potash, 3¼ lb. each of argol and sulphuric acid; boil for two hours, and dye with fustic, sanders, madder, and logwood, and sadden with copperas.—*R.*

Golden Bronze (54 lb.).—Boil for two hours in a water with fustic, 26 lb.; sumac and sanders, 13 lb. each. Lift, add copperas, 6½ lb., and bluestone, 4½ lb. Re-enter, and boil for half an hour, and rinse.—*C.*

Olive Bronze (54 lb.).—Give a half shade in the vat, and dye with argol, 6½ lb.; bluestone, 4¼ lb.; fustic, 87 lb.; sanders and turmeric, 11 lb. each; madder extract, 6½ lb. Boil two hours, lift, and wash. Add to the bath 6½ lb. copperas dissolved, and re-enter. Lastly, pass through water containing a little carbonate of soda, and rinse in plain water.—*C.*

Metallic Luster on Browns (44 lb.).—Take the dyed cloth through a water at 150° F., with 6½ lb. bluestone, and 16¼ lb. ammonia. Rinse slightly, and take through a water with 13 lb. hyposulphite of soda.—*C.*

Brown on Yarn (55 lb.).—Boil for forty-five minutes with 30 oz. chromate of potash. Take through water the day after, and dye with 26 lb. peachwood and 34 oz. fustic. For very pale shades, 3 oz. sulphate of alumina may be added to the beck. For very dark shades, sadden with logwood.—*C.*

Golden Brown on Cloth (110 lb.).—Boil out 88 lb. fustic and add to the decoction 27 lb. caliatura wood, 8¾ lb. turmeric and 5½ lb. argol. Boil for an hour, lift, add 5½ lb. bluestone, boil for half an hour, lift and sadden with 5 oz. copperas.—*C.*

Reddish Brown on Wool (10 lb.).—Prepare at a boil with ¼ lb. bichromate of potash, 2 oz. oil of vitriol, 1 lb. alum, for one hour and a half. Dye at a boil for one hour with 3 lb. redwood, 1 lb. camwood, 1 lb. fustic.—*C.*

Brown on Wool (100 lb.).—Boil for an hour and a half in a water with 2 lb. bichromate of potash and 2 lb. argol. Boil in a fresh water in a bag 40 lb. fustic. Take out the bag and add to the water 20 lb. camwood, 7 lb. madder, 7 lb. cutch. Boil for fifteen minutes longer; cool, enter the prepared wool and boil one hour. Sadden with 1½ lb. each copperas and bluestone and boil for twenty minutes longer.—*C.*

Brown on Alpaca (10 lb.).—Dissolve 1 lb. alum, ¾ lb. argol, ¾ lb. cudbear. Boil for twenty minutes; cool, enter the goods and boil for an hour; lift and rinse. Enter the goods in another hot water with the decoction of 4 lb. cutch. Give six turns (or, as it is often called, six "ends"). Lift and pass into another hot water containing solution of 1 lb. bichromate of potash; give six turns, lift, drain and pass back into the cutch bath. Rinse and finish with the decoction of 4 lb. redwood. A darker shade is got by giving the goods a little logwood after the redwood bath. Work the goods in the logwood bath for an hour at a boil. Lift and add to the same bath 1 oz. tin crystals and 1 oz. oil of vitriol. Re-enter the goods, six turns, rinse and dry.—*C.*

Brown on Worsteds (100 lb.).—Prepare with a solution of 2 lb. bichromate of potash, 2 lb. argol and 1 lb. tin crystals. Boil for two hours, turning well, lift and wash. Boil in a fresh water for an hour in a bag 10 lb. redwood, 40 lb. fustic, 4 lb. logwood. Take out the bag and add to the same bath 10 lb. cutch, 10 lb. camwood, 16 lb. madder, 2 lb. argol. Let boil fifteen minutes longer, cool and enter the cloth, turning well and boiling for an hour. Lift and add to the same bath 2 lb. each copperas and bluestone. Cool the dye after these ingredients are dissolved. Enter, turn well and boil for fifteen minutes.—*C.*

Brown on Shoddy containing Cotton (100 lb.).—Boil for half an hour 30 lb. fustic, 3 lb. alum, prepared tartar, 2 lb., and bluestone, 1 lb. Add to the liquor 1 lb. bichromate of potash and 12 oz. magenta. Enter, boil very gently, sadden with logwood and tint with turmeric if required.—*C.*

Dark Brown on Felt (35 lb.).—Chromate of potash, 17½ oz.; oil of vitriol, 3¼ lb. Boil for thirty minutes and add extract of logwood, 4 lb. 6 oz.; G. & G.'s brown, 8¾ lb. Boil for one hour, lift, and air.—*Muster Zeitung fur Farberei.*

Gold Brown on Worsted (50 lb.).—Dissolve 3 lb. alum, 1 lb. tartar, 3 lb. sulphuric acid, 12 oz. fast yellow, 5 oz. "orange A," 1 oz. "fast red B" (all these three colors from the Baden Aniline Co.), 4 oz. extract of indigo. Enter at 180° F., and turn till even.—*C.*

Alizarine Brown (100 lb.).—Mordant with 3 lb. bichromate of potash, and ½ lb. bluestone, boiling for one hour and a half. Enter in a fresh water with 5 lb. alizarine, 9 lb. extract of fustic, 6 lb. sumac, and boil for one hour and a half. Sadden with 2 lb. copperas, and boil for half an hour; then leave in the liquor for four hours.—*C.*

Maroon with Alizarine (100 lb.).—Mordant at a boil for two hours with 1½ lb. bichromate of potash and 2 lb. red argol. Enter in a fresh water with 10 lb. alizarine, 6 lb. sumac, and 2 lb. chalk. The shade may be modified by leaving out some or all of the sumac.—*C.*

Dark Brown on Worsted (75 lb.).—Boil 2 lb. alum, 10 lb. sulphate of soda, and 4 oz. red argol with 18 oz. "maroon S," 8 oz. "fast yellow," and 2 oz. "orange A" (all three of the Baden Aniline Co.), and 12 lb. extract of indigo. Enter at 180° F., raise to 212° F., and boil for one hour.—*C.*

Fast Seal Brown.—Fast seal brown on 100 lb. wool yarn: Mordant with 2½ lb. bichromate of potash, 5 lb. red argols. Enter yarn at 160° F.,

raise temperature to boiling point, turn for one hour, lift out and rinse. Dye in a bath of 10 lb. Alizarine, 2 A. B.; 6 lb. extract of logwood, 51°. Enter yarn at 160° F., bring temperature to boiling point, and work for one and one half hours at that heat. Lift out, rinse, and dry.

Brown on Woolen Yarn (55 lb.).—Boil for three quarters of an hour with 30 oz. chromate of potash. Take through water the day after, and dye with 26¼ lb. peachwood and 2 lb. 3 oz. fustic. Lighter or darker shades can be obtained by boiling for a shorter or longer time. For very pale shades, 3½ oz. sulphate of alumina may be added to the beck; and for very dark shades, sadden with logwood.—*R.*

Brown on Woolen Piece Goods.—Boil for one hour with 2 lb. 3 oz. chromate of potash, and the same weight of argol. Let cool in the flot, and dye at a boil for one hour, with 44 lb. fustic, 11 lb. madder, and 11 lb. camwood. Take out, and dissolve in the beck 2 lb. 3 oz. copperas, and 17¼ oz. blue vitriol. Re-enter, and boil for an hour longer.—*R.*

Reddish Brown (22 lb. wool).—Sulphate of zinc, 17½ oz.; oil of vitriol, 20¾ oz.; fast brown (Gutbier & Gotze's), 4 lb. 6 oz.; acid magenta, 8¾ oz. This red brown is quite fast, and may be converted into good black by means of logwood and soda.

Red Brown on Wool (50 lb.).—Boil 6 lb. sulphate of soda, 2½ lb. alum, 4 oz. "orange II," and 6 oz. "claret red" (both of the Farbwerke, Hoechst on the Main), and 5 lb. extract of indigo. Enter at 160° F., turn well, raise to a boil, and dye to shade. If the "orange II" is reduced or omitted, a more purple tone is obtained.—*C.*

Maroon on Yarn (100 lb.).—Chromate of potash, 2 lb.; ground fustic, 6¾ lb.; ground logwood, 1 ⅜ lb.; ground sanders, 60 lb.; turmeric, 2 lb. Mordant in the chrome bath for two hours, and leave the yarn in flat heaps in a cool, dark place till morning. Wash, and enter in the dye beck at 158°–167° F., and do not push to a boil till the shade appears even. Boil for one hour and a half. Wash off at once after dyeing. Darker shades may be produced by increasing the quantities. If orchil is substituted for sanders, the quantity of fustic must be a little increased, as orchil gives a cherry red with chrome.—*C.*

Dead Leaf (55 lb.).—Prepare at a boil with bichromate of potash 17 oz., argol 2 lb. 2 oz. Dye with catechu 6¼ lb., young fustic 4¼ lb., logwood 2¼ lb.—*C.*

Very Dark Olive Brown on Half Woolen Reps (22 lb.).—The wool is first dyed as follows: Boil with argol 8¾ oz., madder 7 oz., extract of fustic 2¾ oz., sumac 8¾ oz., for forty-five minutes. Sadden in the same beck with 1¾ oz. copperas. Finally, dye to shade with picric acid and logwood. Steep overnight in a strong, lukewarm decoction of fustic, and work for an hour in a cold nitrate of iron at 2½° Tw. Rinse, and dye in the cold with decoctions of fustic and logwood.—*C.*

Dark Brown, 5 pieces = 100 lb. Cloth.—20 lb. turmeric, 4 lb. extract of indigo, 15 lb. cudbear, 2 pt. sulphuric acid, 170° Tw., 10 lb. sulphate of soda; enter at boil and work for about ninety minutes.—*G.*

Chrome Puce on Woolen Reps (22 lb.).—Boil the goods for one hour and a half with bichromate of potash, 8¼ oz.; sulphuric acid, ¾ oz. Let lie overnight, and dye, without rinsing in a fresh beck, with extract of fustic, 14 oz.; extract of logwood, 3½ oz.; madder, 14 oz.; calliatura wood, 5¼ oz. Boil for half an hour, darken with the decoction of 17 oz. logwood, and finally sadden, without boiling, with ¾ oz. to 1 oz. copperas.—*C.*

Fast Brown on Mixed Goods with Linen Warps (260 lb.).—Wash with soda crystals and boil with argol 15¼ lb., and alum 16¼ lb. Keep at the boil for an hour; lift, cool, rinse, and dye with 66 lb. madder, boiling for half an hour. Sadden with 33 lb. logwood. To dye the linen, work for two hours at 150° F., in a decoction of 44 lb. prepared catechu; lift, and enter in a boiling water with 3½ lb. bichromate. Rinse and sadden, if needed, in a fresh water with 17 lb. logwood. The tone may be modified by adding a little acid magenta.—*C.*

Chamois (11 lb.).—Make up a water with 6¼ oz. oxalic acid, 3½ oz. tin crystals, 1 to 1¾ oz. cochineal, and a trace of flavine. Boil up, cool, enter, and dye to a shade, raising rapidly to a boil.—*C.*

Cinnamon on Yarns (110 lb.).—Boil for one hour and a half with 20 oz. chromate of potash, 14 oz. argol, 27 oz. alum; and dye by boiling for an hour with 22 lb. camwood, 3½ oz. madder and 6½ lb. fustic.—*C.*

Cinnamon on Yarns (55 lb.).—Boil up 6¾ lb. orchil, 2¼ lb. extract of bark, 9 oz. turmeric, 2¼ lb. alum, 2¾ lb. argol, 8 oz. bluestone. Cool, enter yarns, and boil for half an hour. Lift, add 8 oz. oil of vitriol, and boil for fifteen minutes longer.—*C.*

Cinnamon on Wool (100 lb.).—Boil for ninety minutes with 10 lb. extract of fustic and 50 lb. sanders. Sadden with 1¾ lb. bluestone, and boil for another hour. Cool, add five jugs of lant (stale urine), and let the wool steep for an hour.—*C.*

Claret, 5 pieces, = 100 lb. Cloth.—80 to 100 gal. of water, 30 lb. cudbear, 3 gills sulphuric acid at 170° Tw.; 1 lb. extract of indigo, 2 oz. magenta (acid) crystals; heat up to near boil before entering, and work for seventy-five minutes at boil.—*G.*

Drab on Yarn (110 lb.).—Boil for an hour with 2 lb. 3 oz. logwood, ½ lb. fustic and the same weight each of camwood, copperas and argol.—*C.*

Drab on Cloth (110 lb.).—Boil together 3¼ lb. sumac, 6½ lb. madder, with the decoction of 3½ oz. sanders and 6 oz. fustic. Add 3¼ oz. argol; cool, enter, boil for an hour, and sadden with 1¾ oz. copperas.—*C.*

Drab on Wool (110 lb.).—Boil for one hour with 2 lb. 3 oz. logwood, 8¾ oz. fustic, the same weight of camwood, the same of copperas, and the same of tartar.—*R.*

Dark Drab on Wool (50 lb.).—Boil 4 lb. of peachwood, 5 lb. fustic and 2 lb. logwood. Take out the ware, cool, enter the goods, and boil for one hour and a quarter and sadden with copperas.—*C.*

Silver Drab on Wool (100 lb.).—Boil out in a water 1½ lb. ground logwood and ¾ lb. orchil. Enter, boil for seventy-five minutes, sadden with 3 oz. copperas, and boil for twenty minutes more.—*C.*

Drab on Worsted.—One Bath. 100 lb. worsted; boil 5 lb. alum; 5 lb. Glauber salts. Then add 3 lb. extract of indigo, 1½ lb. orchil, 1 oz. picric acid, ¼ oz. blue violet, BB (E. Sehlbach & Co.). Enter the yarn at 160° F., give six turns, bring to boiling heat, and boil about half hour, give six turns, whiz well and dry. If the water is cloudy use about 4 oz. oxalic acid, and skim the same before using dye stuffs.

Dark Fawn Drab on Worsted (50 lb.).—Dissolve at a boil 1 lb. red argol, 3 lb. alum, 2 lb. oil of vitriol, 2 lb. extract of indigo, ¼ lb. extract of orchil, 2 oz. "orange Y" (Levinstein & Co., Manchester). Cool to 180° F.; give ten turns, and wash.—*C.*

Dark Fawn on Wool.—For 100 lb. wool. Work in a bath with tartar, 3½ lb.; sumac, 5½ lb.; fustic, 13 lb.; Brazil wood, 10 lb.; for one and a half hours at the boil. Sadden with copperas, 1 lb. Boil one hour longer, then add Brazil wood, 5 lb.; sanders wood, 1 lb., and boil ¾ hour longer.

Gold on Venetian Carpet Yarn.—One Bath—80 lb. yarn. Dissolve 4 lb. oxalic acid, 2 lb. tin crystal, ½ lb. tin solution or yellow mordant, 1 lb. flavine, 6 oz. cochineal. This vat has to be cleansed by ¼ lb. oxymuriate of tin, at 120° F. A thick mass will come to the surface and has to be carefully skimmed, otherwise the color would not be bright. Enter yarn at 160° F.,

turn continually to boiling heat, to shade desired.

Note.—A more decided yellow tint can be produced by adding more yellow mordant. Caution must be observed not to exceed the use of it, as the yarn will be harsh. Where the water contains lime, a small quantity of crystal tartar will be beneficial to make the yarn more even and soft.

Green (100 lb. wool).—Boil for ninety minutes with 3 lb. bichromate of potash and 3 lb. sulphate of soda crystals. Make up a fresh water with 15 lb. viridine (Baden Anilin Fabrik) and 10 lb. sumac. Enter at 160° F., raise to a boil, and keep at that temperature for one hour. This color bears fulling, and is not affected by acids and light.—*C.*

Acid Green (50 lb. yarn).—Mordant for an hour at 180° F., with 2 lb. hyposulphite of soda and 2 lb. muriatic acid. Lift, and take through a water with 2½ oz. ammonia. Make up a water at 120° F. with 8 oz. acid green F II. (Bindschedler & Busch, of Bâle), and turn to shade, raising the heat to a boil. Lift, wash, and dry.—*C.*

Light Green (100 lb. wool).—Mordant at a boil with 2½ lb. bichromate of potash and 2 lb. tartar, for ninety minutes. Dye in a fresh water with 1 lb. methylene blue and 1 lb. extract of fustic. Boil for forty-five minutes, and let steep for four to eight hours.—*C.*

Iodine Green, on Cloth.—Enter the cloth in a bath made slightly alkaline with ammonia for two or three hours. Wash, and take through weak vitriol sours. Enter in color bath, and dye to shade. The longer the bath is used the finer are the shades dyed.—*C.*

Iodine Green on Wool (30 lb.).—Wash clean, put in a water with 3 oz. stannate of soda and 1½ oz. iodine green powder, previously dissolved in boiling water. Enter the wool, and boil for forty-five minutes, lift, and enter in a fresh water which has been cleared with a little tin crystals, and to which 2 lb. oil of vitriol has been added, and work to shade at a boil.—*C.*

Fast Green on Wool (219 lb.).—Prepare at a boil for one hour and a half with 19 lb. sulphate of alumina, 4¾ lb. chromate of potash, the same weight of oil of vitriol, and 26 oz. tin crystals. Boil up in the dye-pan 1 lb. sulphate of alumina, and remove scum if needed, add 46 lb. acid extract of indigo, 18 oz. French extract of fustic, and 1 lb. salt. Boil for one hour and a half to two hours.—*C.*

Green.—3 pieces = 100 lb. cloth.—80 to 100 gal. water, 10 lb. alum, 1 pt. sulphuric acid, at 170° Tw., 10 lb. extract of indigo, 1¼ lb. picric acid. Boil and enter, and work for ninety minutes. —*G.*

Dark Green.—5 pieces = 100 lb. cloth.—2 pt. sulphuric acid, 170° Tw., 5 lb. sulphate of soda, 15 lb. extract of indigo, 1½ lb. picric acid, 5 lb. cudbear. Enter at boil and work for ninety minutes.—*G.*

Bottle Green (219 lb.).—Boil for an hour and a half with 6½ lb. bichromate of potash and 3¼ lb. argol, and dye at a boil for the same length of time in a water made up with 8¾ lb. French extract of fustic, 2 lb. 2 oz. extract of logwood, and 17½ lb. madder. Sadden with 20 oz. copperas, and boil for half an hour longer.—*C.*

Fast Green on Wool (219 lb.).—Prepare at a boil for ninety minutes with 19½ lb. sulphate of alumina (cake alum); 4 lb. 14 oz. chromate of potash, the same weight of sulphuric acid, and 1 lb. 10 oz. tin crystals. Then boil up in the dye-pan 1 lb. 1½ oz. sulphate of alumina, and remove scum if needful; add 46 lb. "chemic" (some extract of indigo), 18 oz. French extract of fustic, and 17¼ oz. salt. Boil for one and a half to two hours. The chemic is prepared with 6 lb. 9 oz. indigo, and 26 lb. 4 oz. fuming sulphuric acid, diluting with 44 lb. water, after standing for twenty-four hours.—*R.*

Scotch Green on Worsted.—One bath, 50 lb. worsted. Dissolve 10 lb. Glauber salts, 5 lb. alum, ½ lb. red tartar, 30 lb. indigo paste, 4 oz. picric acid, ½ gal. sulphuric acid. Proceed the same with drugs as recipe No. 2, Scotch blue.

Billiard Green on Cloth (110 lb.).—Dissolve in a water 16 lb. 6 oz. alum, boil in it 22 lb. fustic, and add 5 lb. 7 oz. extract of indigo.

Greenish Mode (Reseda) on Wool (55 lb.).—Boil for 90 minutes with 13¾ oz. chromate of potash and the same weight of tartar; let cool in the flot, and dye by boiling for an hour with 8¾ oz. fustic, and the same weight of logwood. —*R.*

Green on Yarn (11 lb.).—Add to a water 26 oz. ground fustic, boil up, remove the wood, dissolve 3¼ lb. alum and 1 lb. argol in the bath, stir well up, and add 3 oz. extract of indigo, let dissolve, cool, enter yarn, and dye for half an hour at a boil.—*C.*

Aurantine Green (128 lb. yarn or wool).—Dissolve 10 lb. alum, 4 lb extract indigo, 2 lb. tartar, 4 lb. oil of vitriol, 5 lb. salt to 1 lb. aurantine. The aurantine is dissolved separately in 2 gal. water with 3 oz. tin crystals. When dissolved add to the dye-beck. Cool, enter, raise to a boil, and dye to shade.—*C.*

Green on Shoddy (100 lb.).—Boil with 12 lb. alum, 2 lb. chromate of potash, 2 lb. common salt, 1 lb. tin crystals, and 2 lb. oil of vitriol. Dye in a fresh water made up with 4 lb. alum, 2 lb. common salt, 5 lb. extract of indigo, and 2 lb. fustic.—*C.*

Brilliant Green on Wool (55 lb.).—Dye with 8 oz. Nicholson blue and 34 oz. borax. After two hours a sample is plunged into dilute sulphuric acid to see if the shade has been reached. As soon as this point is gained, the goods are drained and plunged into a water containing 26 oz. sulphuric acid and 5¼ oz. picric acid.—*C.*

Green on Worsted (25 lb.).—Dissolve 3 oz. new acid green (F. Bayer & Co., of Barmen), 3 lb. sulphate of soda, ½ lb. oil of vitriol. Clear the liquid, if needful, enter at 150° F., turn briskly, and raise slowly to a boil. The green should be dissolved in the cold.—*C.*

Dark Peacock Green on Worsted Yarn (25 lb.).—Dye in an alkaline bath with 2 oz. Nicholson blue and 3 oz. Victoria green (Baden Aniline Co.), for three-quarters of an hour. Lift, rinse, and finish in sours at 150° F., giving five turns.—*C.*

Dark Green on Flannel (100 lb.).—Mordant with 2½ lb. bichromate of potash and 2 lb. tartar, boiling for one hour and a half. Dye in a fresh water with 1½ lb. methylene blue O (Baden Aniline Co.) and 1½ lb. each extracts of logwood and fustic, boiling for three-quarters of an hour.—*C.*

Fast Dark Green on Wool (100 lb.).—Boil for one hour and a half with 1¼ lb. bichromate of potash, ¾ lb. tin crystals, 8 lb. alum and 1 pt. oil of vitriol. Enter in a fresh water with 15 lb. extract of indigo, 2 lb. extract of fustic, 4 lb. alum and 4 lb. salt. Boil till level.—*C.*

Olive Green on Wool (100 lb.).—Add to a boiling water 1 lb. "new yellow," 4 oz. "orchil substitute" (both of Lutz & Moebius, New York), 2½ lb. extract indigo, 8 lb. sulphate of soda, 3 lb. oil of vitriol and 2 lb. alum. Work the yarn at a boil for one hour and a quarter.—*C.*

Etincelle Green on Woolen Yarn (100 lb.).—Prepare for an hour in a water at 180° F., containing 8 lb. hyposulphite of soda and 8 lb. muriatic acid. Lift, and wash in a fresh water, cold, with 4 oz. ammonia. Make up a fresh water at 120° F., with 1 lb. green etincelle (Monnet & Co., of Geneva). Enter yarn, turn to shade, raising temperature to a boil, lift, wash, and dry. The solid greens J and J 4 of the same firm are dyed in the same manner.—*C.*

Emerald Green on Worsted (50 lb. yarn).—Dissolve in very pure water 6 oz. emerald green (Baden Aniline Co.) and 4 oz. oil of vitriol. Enter at 160° F., and turn constantly while raising temperature to 180° F.—*C.*

Sea Green on Coarse Woolen Yarn (55 lb.).—Make up a water with prepared tartar, 8 lb.; sulphate of soda, 2 lb.; argol, 8¾ oz. Dissolve

separately in a pot. Light green (Baden Aniline Co.), ⅞ oz.; indigotine, 1¾ oz.; cochineal waste, 5 to 7 oz.—*C.*

Imperial Green.—To dissolve the color (of G. Dore & Co., of Frankfort-on-the-Main), add the color along with an equal weight of acetic acid at 9½° Tw., to about ten times its weight of hot water. Raise to a boil, and filter. Enter at 140° F., and gradually raise to a boil. The addition of more acetic acid gives a bluer tone, while picric acid, with very little sulphuric, turns it yellower.—*C.*

Dark Steel Green on Half Woolens (56 lb.).—Mordant for an hour at a boil with 8½ oz. chromate of potash, 7 oz. oil of vitriol, and the same weight of tin crystals. Let the goods lie overnight, and dye in a fresh water with 19 oz. extract of indigo, 4½ oz. extract fustic, and 14 oz. extract logwood, boiling for half an hour. They are then, if needful, brought up to shade with a little decoction of logwood, steeped overnight in a little lukewarm solution of 8½ tannin, taken through cold black liquor at 1¼° Tw. for half an hour, aired, rinsed, and cotton dyed in the cold with the solution of 7 oz. methyl green B, 1¾ oz. extract of fustic, and the same weight extract of logwood.—*C.*

Reddish Gray on Yarns (55 lb.).—Boil for an hour with 6½ lb. fustic, 5½ lb. catechu, 4½ oz. chromate of potash, and 13 oz. copperas.—*C.*

Gray Mode (110 lb.).—Boil for an hour with 4¼ oz. alum, 5½ lb. sulphate of soda, 17 oz. oil of vitriol, 1¾ oz. extract of indigo, and the same weight of orchil liquor.—*C.*

Slate Gray (55 lb.).—Boil the wool or pieces with 11 lb. logwood, 17 oz. sulphate of soda, and 8 oz. sulphuric acid. Lift, and dissolve in the beck 8 oz. copperas, re-enter, and boil for another half hour. If a very blue tone is required, top with ammonia.—*C.*

Pearl Gray on Wool and Yarns (218 lb.).—Give a light blue ground in the vat, and rinse well. Add to a water 34 oz. perchloride of tin, boil up and skim carefully. Add 5½ lb. chloride of tin and 26 oz. ammoniacal cochineal, and dye for forty-five minutes at a boil.—*C.*

Light Gray on Wool (55 lb.).—Boil for an hour with 8¾ oz. perchloride of tin, 1 lb. 9 oz. alum, 1¾ oz. extract of indigo and 1 oz. cochineal.—*C.*

Reddish Gray on Yarn (40 lb.).—Alum, 5 lb.; argol, 1½ lb.; extract of indigo, 10 oz.; fustic, 1 lb., and orchil 10 oz. Boil, cool, enter and dye at a boil of three-quarters of an hour.—*C.*

Mode Gray on Yarn (100 lb.).—Boil for thirty minutes with 25 lb. alum and 3 lb. argol. Lift, and add to the same beck 10 lb. extract of indigo, 15 lb. fustic and 1 lb. picric acid. Enter at a boil, and work for forty minutes.—*C.*

Slate Gray on Alpaca (50 lb.).—Boil with 4 lb. alum and 2 lb. argol, and dye with 3 lb. ground logwood, 4 oz. cudbear, and 2 oz. extract of indigo.—*C.*

Greenish Gray on Cloth (10 lb.).—Boil 6 oz. galls, ¼ lb. fustic and 1 lb. argol. Cool, enter goods; boil for half an hour, lift, and add 3 oz. copperas; re-enter, and dye to shade at a boil.

Reddish Gray on Cloth (10 lb.).—Boil 6 oz. galls, ¼ lb madder and 1 lb. argol. Cool, enter the cloth; boil for half an hour, lift, and add ¼ lb. copperas; re-enter, and dye to shade at a boil.—*C.*

Lead Color on Wool (260 lb.).—Boil for an hour with logwood 22 lb., sumac 34 oz., fustic and alum 1 lb. each, argol ½ lb. At the end of this time sprinkle the solution of 2 lb. 10 oz. into the beck and boil for half an hour longer.—*C.*

Fast Ash Gray on Cloth (70 lb.).—Give a medium blue in the vat, and enter in a water with 3¼ lb. sumac, the same weight of tartar, 4¾ lb. calliatura wood, 6½ lb. madder, 3¼ lb. ground fustic, and 1 lb. 10 oz. ground logwood. Boil the pieces for an hour and sadden with 8¾ oz. copperas.—*C.*

Wood Gray (on 132 lb.).—Boil for an hour with 34 oz. argol, 13 oz. madder, 8¾ oz. fustic, 26 oz. sumac and 1½ piggins logwood liquor. Sadden with 1 oz. copperas.—*C.*

Silver Gray on Half Woolen Cloth (20 lb.).—Dissolve 2 oz. tannin in a hot water, and turn for an hour. Sadden in a fresh water with 1 lb. nitrite of iron to shade.—*C.*

Fast Pearl Gray (120 lb.).—Dry a light blue in the vat, rinse, and make up a boiling water with 3 lb. alum, 3 lb. tartar, 2½ lb. cochineal and 1 lb. sulphate of tin. Enter, and boil for twenty-five minutes.—*C.*

Ivory on Woolen Cloth (for two pieces of 42 lb.).—A bath is made of 2 lb. alum, 2 lb. tartar, 1 oz. indigo carmine and 2 oz. madder, in which the cloth is boiled for one hour.

Jacquineaux on Worsted (50 lb.).—Prepare 2 lb. alum, 4 lb. Glauber salts, 2 oz. fast red, R, 2 oz. fast red, RRR—(Pickhardt & Kuttroff). Enter at 150° F., turn continually, and raise to boiling, which will produce scarlet shade. Second bath, 4 oz. fuchsine, ½ lb. orchil carmine (Pickhardt & Kuttroff). Enter at 150° F., raise to 200° F.

Note 1.—In the first bath it is liable to turn uneven, but by careful working and quick turning, it can be avoided. 2.—This is a valuable substitute for cochineal.

Wood Color on Half Woolens (4 lb. 6 oz.).—Sulphate of soda 2 lb. 3 oz., sulphate of alumina 4 lb. 6 oz., orchil 2 piggins, turmeric 11 lb. Dye, wash, and pass into a water, to which have been added bichromate of potash, turmeric, and redwood.—*C.*

Blue Lavender on Yarns (110 lb.).—Boil for an hour with 2 lb. 3 oz. logwood, 4½ oz. extract of indigo, 1 lb. orchil, ½ lb. each alum and copperas.—*C.*

Lavender on Wool (100 lb.).—Boil out with 5 lb. logwood, 3 lb. orchil, and ½ lb. camwood; enter the goods, boil for one hour and a quarter, and sadden with 10 oz. copperas.—*C.*

"Modes" on Alpaca (100 lb.).—The term "modes," often met with in French and German receipts for dyeing, has no exact equivalent in English. It includes a number of very impure colors, which are neither brown, gray, drab, nor olive, but incline sometimes to one and sometimes to another.

Shade 1.—Boil with 2 lb. argol, 3 lb. madder, ¾ lb. fustic, ¼ lb. ground logwood, ⅛ lb. galls, ½ lb. cudbear, and 2 oz. extract of indigo. Sadden with ¼ lb. copperas.

Shade 2.—2 lb. argol, 5 lb. madder, 1½ lb. ground fustic, ½ lb. galls, ½ lb. cudbear, and 1 lb. ground logwood. Sadden with 1 lb. copperas.

Shade 3.—Boil with 1½ lb. bichromate potash and 1 lb. argol. Dye with 12 oz. ground logwood, 1 lb. ground fustic, 8 lb. madder, and 4 oz. galls. Sadden with 1 oz. copperas.

Shade 4.—Boil with 8 lb. madder, 3 lb. calliatura wood, 1 oz. galls, 1 lb. argol, and 20 oz. ground fustic. Sadden with 2 oz. copperas and 4 oz. cudbear.

Shade 5.—1 lb. argol, 4 lb. madder, 1¼ lb. ground fustic, 1 oz. galls and 8 oz. cudbear. Sadden with 1½ oz. copperas.

Shade 6.—Boil with 4 lb. alum and 1 lb. argol, and dye with 2½ lb. ground fustic and 4 oz. madder. Sadden with 1 oz. copperas.—*C.*

Medium Blue Mode on Half Woolens (100 lb.)—The wool is first dyed with Nicholson blue, ⅞ lb.; soda, 1½ lb., at a boiling heat for an hour, and raised in a fresh, hot water, with the necessary quantity of sulphuric acid. The goods are then steeped overnight in the hot solution of tannin 1½ lb. and hæmatine ⅝ lb. They are then taken through a cold black liquor at 2½° Tw., rinsed, taken again through the tannin bath and rinsed. Instead of hæmatine, decoction of logwood may be used, and the goods may be topped with extract of indigo, methyl blue or methyl violet, according to the shade required.—*C.*

Yellowish Mode for Mixed Goods (10 lb.).—Boil 1 lb. good catechu in water; let settle and dissolve 1½ oz. bluestone in the clear solution. Raise to a boil and work the goods first at that heat, and afterward at 122° F. Lift, drain and

make up a cold water with ½ lb. nitrate of iron. Work for an hour, drain in the centrifugal, and make up a fresh boiling water with 1½ oz. chromate of potash. Work for quarter of an hour, rinse and dry. For yellower tones, a little fustic and alum may be added; and for redder tones, peachwood and magenta.—*C.*

Mulberry on Wool (11 lb.).—Boil for an hour and a half with 2¾ oz. chromate of potash, 7 oz. alum, 1¾ oz. bluestone and 5½ oz. prepared tartar. Let cool in the flot, or rinse at once. Then dye in a water with 30 oz. logwood, 5½ lb. camwood and 1 lb. cudbear, boiling for seventy-five minutes.—*C.*

Mulberry on Cloth (84 lb.).—Boil with 1½ lb. bichromate of potash, and dye in a fresh water with 10 lb. camwood, 10 lb. logwood, 10 lb. cudbear, boiling for half an hour and adding 1 qt. ammonia.—*C.*

Greenish Mode on Yarns (55 lb.).—Boil for an hour with 13 oz. chromate of potash and the same weight of argol. Let cool in the liquid and dye in a fresh water at a boil for one hour, with 2 lb. 3 oz. fustic, 9 oz. sanders and the same weight of sumac.—*C.*

Greenish Olive on Yarns (55 lb.).—Prepare as in the last receipt and dye with catechu 2 lb. 3 oz., fustic 6½ lb. and logwood 17 oz.—*C.*

Another Olive on Yarns (55 lb.).—Prepare as above and dye with 2 lb. 3 oz. logwood, 17 oz. fustic and the same weight each of sumac and sanders.—*C.*

Golden Olive on Wool (219 lb.).—Boil for an hour and a half with 6½ lb. chromate of potash, 3¼ lb. bluestone and 1 lb. 10 oz. oil of vitriol. Dye with 12 lb. French extract of fustic, 17 oz. French extract of logwood, 6½ lb. sanders, and the same weight of madder. Boil for an hour and a quarter, sadden with 26 oz. copperas and boil for half an hour longer.—*C.*

Golden Olive on Cloth (110 lb.).—Boil together, the decoction of 88 lb. fustic, 22 lb. turmeric, 2¾ lb. orchil, 11 lb. alum and 4 lb. 6 oz. argol. Cool, enter and boil for an hour.—*C.*

Light Olive on Wool (50 lb.).—Boil for an hour and a half with ½ lb. chromate of potash, ½ lb. argol, and ¼ lb. alum. Dye in a fresh water with ¼ lb. logwood, 1 lb. fustic and ¼ lb. camwood.—*C.*

Olives on Carpet Yarn (100 lb.).—Dye in water slightly soured with oil of vitriol, at 160° F., with 1 lb. olive No. 1 (Clayton Aniline Company, Manchester). Raise to a boil, work for thirty minutes and wash. Use the "olive" in two halves—one to begin with and the other in about fifteen minutes.

Olives No. 2 and No. 3, used in the same manner, give different shades.—C.

Olive on Woolen Reps (10 lb.).—Boil for forty-five minutes with alum 5¼ oz., oil of vitriol 4¾ oz. Lift and add to the same bath, picric acid 6½ oz., extract of indigo 6 to 6¼ oz. Boil for forty-five minutes, lift, and add orchil 14 to 15½ oz. Boil till even, and wash.—*C.*

Bronze Olive on Cloth (50 lb.).—Boil for two hours with fustic, 38 lb.; logwood, 3 lb.; calliatura wood, ½ lb.; sumac, 3 lb.; argol, 2 lb. Sadden with bluestone, 2 lb. Boil for an hour, and then add copperas, 2 lb. and boil for an hour longer.—*C.*

New Orange (100 lb. yarn).—Dissolve in a water 10 lb. sulphate of soda, 1½ lb. of the "New Atlas Orange" (Brooke, Simpson & Spiller) and 2 lb. oil of vitriol. Enter at 180° F., raise to 212° F. and boil for fifteen minutes.—*C.*

Orange (50 lb. yarn).—Make up a water at 170° F. with 8 oz. "orange" (Bindschedler, Busch & Co.). Add 1½ lb. oil of vitriol. Give three to five turns, raising to a boil and boil for ten minutes.—*C.*

Orange (110 lb. cloth).—Boil up in a water 26 oz. perchloride of tin; add 5 lb. oxalic acid, 3¼ lb. tin crystals, 17 oz. flavine and from 7 to 17 oz. cochineal. Cool, enter the cloth, and boil for three-quarters of an hour.—*C.*

Aurantine Orange on Yarn (100 lb.).—Add to a water 1 lb. aurantine, 2 lb. tartar, 3 lb. cochineal, ½ lb. tin crystals, 8 lb. muriate of tin and 5 lb. muriatic acid. Boil ten minutes before entering the yarn; cool, enter, turn for ten minutes and boil for half an hour. Rinse and dry.—*C.*

Orange on Worsted (50 lb.).—Prepare bath with 2½ lb. oil of vitriol and ½ lb. fast orange (Reid, Halliday & Sons, Huddersfield). Enter at 180° F., raise to a boil, turn to shade and wash.—*C.*

Light Orange on Cloth (84 lb.).—Boil up in a water 8 lb. fustic, add 20 oz. ground cochineal, 1 gal. nitrate of tin and 4 lb. tartar crystals. Boil for three minutes and enter.—*C.*

Orange on Half Woolens (4 lb. 6 oz).—Dye in one bath. Dissolve annatto, 6½ lb., in carbonate of soda, 4 lb. 6 oz. Dissolve at a boil and add turmeric according to the shade. Enter in the dye beck cold and raise the heat till the shade is obtained. Wash.—*C.*

Dyeing Cochineal Red on Flannel (22 lb. flannel).—1 lb. 10 oz. oxalic acid, 8¾ oz. tin crystals, 2 lb. 3 oz. cochineal and ¾ oz. flavine are boiled well together, cooled, the goods entered and winced till the desired shade is produced. If a blue tone is required no flavine is added, but for yellow tones as much as 1¾ oz. flavine may be used.

Scarlet (50 lb. yarn).—Make up a water with 5 lb. sulphate of soda, 1 lb. oil of vitriol, and 10 oz. ponceau 3 R C (of A. Poirrier, of Paris). Enter yarn at 180°, give three turns, raise to a boil, which is kept up for fifteen minutes. Lift, wash and dry.—*C.*

Scarlet (50 lb. yarn).—Make up water at 170° F., with 8 oz. "scarlet R R" (Bindschedler, Busch & Co., of Bâle), and 1½ lb. oil of vitriol. Enter, give three to five turns while raising to a boil; boil for ten minutes, wash and dry.—*C.*

New Atlas Scarlet (100 lb. yarn).—Dissolve in a water 1½ lb. New Atlas Scarlet No. 1 (Brooke, Simpson & Spiller), 10 lb. sulphate of soda, and 2 lb. oil of vitriol. Enter at 180° F., raise to 212° F., and boil for a quarter of an hour.—*C.*

Crimson on Cloth (20 lb.).—Dissolve 1¾ oz. magenta crystals in 1 lb. glycerine at a boil, filter, and add the solution to a water in which ½ lb. picric acid and ¼ lb. carbonate of soda crystals are dissolved. Boil the bath for a quarter of an hour, and skim off any impurities which rise to the surface. Enter the cloth, and dye to shade at a boil. Drain, but do not rinse.—*C.*

Cochineal Pink (30 lb.).—Make up a water with 1 pt. tin solution and ¾ lb. of tartaric acid; let it boil, skim, add ¼ lb. cochineal, let cool a little. Enter the wool, and boil for half an hour. The tin solution is made by dissolving 5 lb. tin in a mixture of 10 lb. muriatic and 10 lb. nitric acids.—*C.*

Fast Cochineal Crimson on Wool (10 lb.).—Boil a water for ten minutes with ½ lb. tartar crystals, and skim if needed. Add 1 lb. alum and ¾ lb. tin solution. Boil the wool in this mordant for half an hour, and then dye with 1¼ lb. ammoniacal cochineal paste and a small quantity of tin solution.—*C.*

Fast Alizarine Red on Yarn (22 lb.).—Boil for one hour and a half with 3¼ lb. sulphate of alumina and 17 oz. tartar. Rinse well, and dye with 14 oz. alizarine paste at 10%, entering the goods in the cold beck, and raising to a boil. If the spent beck is mixed with 17 oz. sulphate of alumina, the same weight bisulphate of soda, a little fustic and indigo-extract residues, it produces a fine brown.—*C.*

Another Alizarine Red.—Put the wool or woolen goods in a solution of 34 oz. soap, in 22 lb. water at 110° F., for twenty minutes. Press between cloths, dry in hot air, take through red liquor at 5° Tw., to which has been added a solution of 1 oz. sulpho-muriate of tin per pt., and dry in hot air. Take through a solution of 60 grn. silicate of soda at 92° Tw. for 35 fl. oz. Heat to 110° F., wash, and drain in the centrifugal. Dye with alizarine for reds, using for 35 oz. wool, 7 oz. alizarine at 10° F.—*C.*

Rose on Wool, for Fulling (110 lb.).—Boil up 13 lb. 2 oz. alum, 5½ lb. argol, 8¾ oz. perchloride of tin, the same weight of tin crytals and 2 lb. 3 oz. cochineal. Cool, enter the wool and dye for an hour.—*C.*

Crimson on Yarn, for Fulling (55 lb.).—Make up a water with 8¾ oz. perchloride of tin and an equal weight of oil of vitriol. Add a clear solution of magenta as required. Enter yarns, dye at a boil, rinse and dry.—*C.*

Full Red on Yarn, for Fulling (74 lb.).—Boil up a water with 34 oz. perchloride of tin, add to the beck 4¼ lb. oxalic acid, 2¾ lb. tin crystals, 10½ oz. flavine and 20 oz. cochineal. Cool, enter the yarn and dye at a boil for half an hour. Add 4 lb. 6 oz. alum and boil for fifteen minutes longer.—*C.*

Aurantine Ponceau (80 lb.).—Boil up 2 oz. aurantine, 6 oz. tin crystals, 10 lb. cochineal, 2 lb. tartar, ½ lb. tin crystals. Boil ten minutes, cool, enter yarn, turn ten minutes, boil for half an hour, rinse and dry.—*C.*

Aurantine Scarlet (80 lb.).—Add to a water 8 lb. cochineal, 2 lb. tartar, 8 lb. muriate of tin, 6 oz. tin crystals and 2 oz. aurantine. Work as in the last receipt.—*C.*

Crimson on Alpaca (100 lb.).—Prepare at a boil with 4 lb. alum and ¼ lb. tartar, and dye with 10 oz. best magenta.—*C.*

Magenta on Shoddy (100 lb.).—Boil with 8 lb. alum and 1 lb. argol, and dye with 10 oz. magenta.—*C.*

Rouge de Gravelotte.—A cochineal red, grounded as usual with cochineal, oxalic acid and tin crystals, and topped in a fresh water with magenta, or preferably with saffranine.—*C.*

Ponceau on Cloth (100 lb.).—Clear the water at a boil with ½ lb. perchloride of tin, boil 2½ lb. bark, tied up in a bag, for fifteen minutes. Take out the bag and add 4 lb. oxalic acid, 3 lb. tin crystals, 1 lb. tartaric acid, 1 lb. tartar crystals and 6½ to 7 lb. ground cochineal. Boil up, cool and enter the goods previously wetted.—*C.*

Red for Woolen Yarns, for Fulling (100 lb.).—Boil with 8 lb. cochineal, 8 lb. tartar crystals, 4 lb. oxalic acid, 4 lb. tin crystals, 6 lb. tin solution and 6 lb. young fustic lake. The tin solution is made by dissolving 10 lb. tin crystals and 25 lb. bichloride of tin in 3½ gal. hot water.—*C.*

Fiery Madder Red on Wool, to bear Fulling (100 lb.).—Boil for an hour with 12 lb. alum, 10 lb. tartar, 2 lb. oxalic acid. Rinse and dye with 50 lb. madder, boiling slowly for one hour and a half to two hours. The color is faster if 25 lb. alum are taken; 13 lb. garancine may be used instead of the madder, or about 5 lb. alizarine for red.—*C.*

Rose and Crimson on Woolen Yarns.—Dissolve 2 parts magenta, 2 parts silicate of soda, 1 part sulphate of soda, and (for the crimson) a little picric acid. Work the yarn at 167° F. The magenta must be well dissolved and strained to prevent spotting. After dyeing, work the yarns for a quarter of an hour in a fresh, cold water with two parts hyposulphite of soda.—*C.*

Salmon.—5 pieces = 100 lb. of cloth, dye vessel, water usual quantity, 2 pt. protochloride of tin, 120° Tw., 4 oz. flavine, 6 oz. cochineal, 4 lb. bitartrate of potash. Enter at boil, and work for 40 minutes. Wash.—*G.*

Sang de Bœuf on Yarns (11 lb.).—Boil for three-quarters of an hour with 2¾ oz. chromate of potash, ½ oz. bluestone, 13 oz. argol, 1 oz. sulphuric acid. Let the yarn cool in the bath, and then dye in a fresh water with 4¼ lb. peachwood and 4¼ to 5¼ oz. logwood. Boil for half an hour.—*C.*

Darker Sang de Bœuf on Yarns (11 lb.).—Prepare at a boil with 4½ oz. chromate of potash, 1⅛ oz. bluestone, 13 oz. argol, 1⅛ oz. oil of vitriol. Let cool in the liquid, and dye for half an hour at a boil with 4¼ lb. peachwood, ½ lb. fustic and 1 lb. logwood. The woods are used in the form of clear decoctions, added by degrees.—*C.*

Scarlet on Worsted (50 lb.).—Dissolve 3½ oz. scarlet XXB and 2 oz. orange (both of Banning, Bissell & Co., New York), 8 lb. sulphate of soda, 1½ lb. oil of vitriol, ½ lb. alum. Cool, enter at 180° F., raise to a boil and turn to shade.—*C.*

Garnet on Floss Worsted (60 lb.).—Boil 6 lb. sulphate of soda, 2 lb. alum, 3 lb. sulphuric acid, 6 oz. orange A, ½ lb. maroon S, 2 oz. magenta S (all three of the Baden Aniline Co.). Cool, enter yarn and boil to shade. After boiling half an hour, add ½ lb. extract of indigo.—*C.*

Crimson on Carpet Yarn (100 lb.).—Dissolve 10 lb. sulphate of soda, 2 lb. alum, 3 lb. oil of vitriol, ½ lb. scarlet and 3 oz. magenta (both of Levinstein & Co., Manchester). Enter at 180° F., ten turns while raising to 212° F., and turn to shade.—*C.*

Ruby (100 lb. yarn).—Dissolve 1½ lb. orselline (Clayton Aniline Co., Manchester). Enter at 160° F. and raise to a boil, turning to shade. The addition of alum brightens.—*C.*

Garnet on Worsted Yarn (50 lb.).—Boil 5 lb. sulphate of soda, 3 lb. oil of vitriol, 10 oz. nacarat, and 3 oz. orange (both of the Berlin Aktien Gesellschaft), and ½ lb. extract of indigo. Enter, boil for three-quarters of an hour, turning to shade.—*C.*

Scarlet on Worsted (50 lb.).—Dissolve 3 lb. alum, 3 lb. sulphate of soda, 2½ lb. oil of vitriol, 1 lb. fast scarlet R (Reid, Halliday & Sons, Huddersfield). Enter at 180° F., five turns, raise to a boil and turn to shade. Wash.—*C.*

Rose Bengale on Woolen Yarn (50 lb.).—Dissolve in water 4 lb. alum and 3 oz. "rose Bengale B" (Farbwerke, Hoechst am Main). Enter yarn at 180 F., and turn to shade, raising temperature to a boil.—*C.*

Fast Cardinal on Wool (100 lb.).—Dissolve 1¼ lb. orange 23 and 5 oz. acid magenta (Bredt & Co., New York), along with 13 lb. sulphate of soda and 2 qts. oil of vitriol. Enter and boil to shade.—*C.*

Phloxine on Woolen Yarn (50 lb.).—Dissolve in a hot water ½ lb. phloxine BB (P. Monnet & Co., Geneva). Enter yarn at 180° F., five turns while raising to a boil. Lift and add ½ lb. acetic acid. Re-enter, give four turns.—*C.*

Eosine on Woolen Yarn (50 lb.).—Dissolve 6 oz. eosine (P. Monnet & Co.), enter yarn and work in the same manner as phloxine.

The "Eosine J" of the same firm is dyed as follows (100 lb.): Dissolve 20 oz. eosine J, and add the half of it and 1 pt. acetic acid to a water at 120° F. Enter yarn, work for half an hour; lift and add the remainder of the color to the acid. Re-enter yarn, work for another half hour, raising the heat to 180° F. Wash and dry.

The "Rose Bengal NT" of the same firm is also dyed in the same manner.—*C.*

Flesh Color on Worsted (50 lb.).—Clear the water well, if needful, by boiling it up with a little sulphate of soda and sulphuric acid. After skimming add 5 lb. sulphate of soda and 1 lb. oil of vitriol with ¾ oz. scarlet RRR (Farbwerke, Hoechst am Main). Enter at 150° F., turn well, heating to 180° F. and work to shade.

Fast Bluish Cardinal on Wool (50 lb.).—Boil up 6 oz. magenta S and 1 oz. orange A (both of the Baden Aniline Co.), 10 lb. sulphate of soda, 5 lb. alum and add 3 lb. oil of vitriol. Cool, enter yarn at 150° F., turn till level, raise to a boil, which is kept up for one hour.—*C.*

Scarlet.—75 lb. cloth or yarn, 1¾ lb. eosine dissolved in the bath, say at 120° F. (49° C.), add 3 gills sulphuric acid at 170° Tw. Enter the goods say at 140° to 145° F. (60°–63° C.), and gradually bring to boil in from fifteen to twenty minutes and take out.—*G.*

Rocceline Scarlet (11 lb.).—Boil for an hour and a half with ¾ oz. stannate of soda and the same weight each of tartaric acid and oxalate of potash. Lift and dye in a fresh water, boiling for one hour with 3½ oz. rocceline and ¾ oz. saffranine of a yellowish tone. Let the wool cool in the liquor, lift and rinse. Darker

shades may be obtained in a similar manner by preparing the same quantity of wool with 1¾ oz. oxalate of potash and ⅜ oz. alum.—*C.*

Fast Red on Cloth (60 lb.).—Prepare a clean water at a boil, and add ½ lb. alum, ¼ lb. solid chloride of tin and 1 lb. powdered starch. Skim carefully and take the cloth through slightly to dampen the same. Add to the bath 8 lb. alum, 2 lb. tartaric emetic, ¾ pt. acetic acid, the solution of 2 oz. aniline orange. When well mixed, enter and raise to boiling point in half an hour. Let cool down to 170° F. and add, in three doses, the solution of 6 oz. eosine B; gradually increase the temperature again while turning the cloth, and shade off with 2 oz. aniline orange and ¾ pt. acetic acid. This red may be dyed in copper vessels and is only half the price of a cochineal red. It may be dyed over black checks without interfering with the black.—*C.*

Another Fast Red on Cloth (24 lb.).—Boil in a water containing 4 lb. alum, 12 lb. madder, 4½ lb. tartar crystals, and 3 lb. nitrate of tin. Let lie twenty-four hours and pass into a water with 5 lb. cochineal, ½ lb. tartar, and boil for an hour. Add 5 lb. lac dye and 2 lb. nitrate of tin; boil for an hour and pass into a bath of 3 lb. madder and 2 lb. nitrate of tin.—*C.*

New Scarlet on Wool (60 lb.).—Yarn well scoured, washed in warm water and whizzed. Run beck three-quarters full of water and boil. Put in 10 oz. "scarlet OO" (A. Poirrier, of Paris, and Thompson, of Manchester). Boil well and add 9 lb. sulphate of soda and 1 qt. oil vitriol. Fill up with cold water, stir well and enter yarn. Keep turning for fifteen to twenty minutes and heat gradually to a boil in seventy-five minutes. This is a very fast scarlet.—*C.*

Garnet on Half Woolens.—Boil for half an hour with a water containing 6¼ oz. bichromate of potash, 4¼ oz. oil of vitriol and 2 oz. bluestone. Rinse and enter in a water at 122° F., containing magenta 1⅜ oz. and methyl violet ¼ oz. Heat to a boil, lift, wash and rinse.—*C.*

Claret on Half Woolens.—Boil for half an hour with bichromate of potash 6¼ oz., oil of vitriol 4¼ oz. and bluestone 2 oz. Rinse and dye with magenta 1⅜ oz., aniline scarlet 1⅝ oz., orchil 6¾ lb., and turmeric 12 oz. Enter cold, raise slowly to a boil, and after boiling for an hour and a half lift and wash.—*C.*

Corinthe-on Damask (20 *yds.*).—Boil for half an hour with alum 17 oz., argol 17 oz. Then add orchil 2 lb. 2 oz., extract of indigo 8½ oz., oil of vitriol ½ oz. Dye to shade at boil. Lift and rinse.—*C.*

Dark Garnet on Half Woolens (22 lb.).—Dye the wool to shade in boiling water with orchil, a little extract of indigo and prepared tartar. Steep overnight at a hand heat with cathechu, 2 lb. 3 oz.; bluestone, 7 oz. Sadden at hand heat with chromate of potash, 3½ oz.; copperas, 1¾ oz. Steep overnight in the cold solution of 2 lb. 3 oz. alum, and dye the cotton to shade in the cold, with the decoctions of peachwood, fustic and logwood.—*C.*

Red on Half Woolens (11 lb.).—Boil for an hour with 17 oz. white argol and the same weight of argol. Dye at a boil for fifteen minutes with 4 lb. 14 oz. peachwood and 2¾ lb. fustic. Rinse, steep for fifteen minutes in the decoction of 2 lb. 3 oz. fustic and work for the same length of time in red cotton spirits at 4° Tw. Let drain and cotton dye to shade in the cold decoction of 17 oz. peachwood and the same weight of fustic.—*C.*

Reseda on Yarns (55 lb.).—Boil for an hour and a half with 13 oz. each chromate of potash and argol. Let cool in the liquor, and dye at a boil for an hour with ½ lb. fustic and 1 lb. logwood.—*C.*

Solid Shades for Wool.—Ash Gray.—Boil for 90 minutes with 4% of gallnuts, 2 of sumac, 4 of logwood, 3 of copperas, diminishing the proportion of the ware for light shades.

Mode Gray.—Boil for the same length of time with 3% of gallnuts, 1 logwood, 4 orchil, ⅛ soluble iodine violet, and 1 copperas.

Olive.—Boil as above with 50% of fustic or 15 extract of fustic, 5 logwood, 4 bluestone, 4 argol, 3 orchil and 1 copperas.

Jet Black.—Boil for 90 minutes with 2½% of bichrome and 2 of sulphuric acid. Lift, spread out and let lie till quite cold, and dye in a second water with 40% of logwood, 8 fustic and 1½ bluestone. After boiling for an hour, wash dry.

Blue Black.—Prepare as above with 2½% of bichrome and 2% sulphuric acid. Then boil for the same length of time in a second water with 40% logwood and 1½% bluestone. Wash and dry.

Bright blue.—Prepare as above with 3% of bichrome, 2% sulphuric acid and 2% alum. Dye in a second water with 25% logwood, and the solution of ¼ soluble aniline violet. Wash and dry.

Reddish Brown.—Boil for 90 minutes with 3% of bichrome and 2% sulphuric acid. Let cool in the flot, and enter in a cold water made up of 30% of peachwood, 5% of fustic and ¼ of alizarine orchil. Raise to a boil, and keep it up for half an hour.—*Teinturier Pratique.*

Darker Shade of Reseda (55 lb.).—Prepare as above and dye with 8 oz. logwood, 1 lb. extract of indigo and 4½ oz. orchil.—*C.*

Light Reseda on Yarn (100 lb.).—Boil 10 lb. alum, 3 lb. argol, 2 oz. oil of vitriol, 5 oz. extract of indigo, 7 oz. orchil paste and 2½ oz. picric acid, or, in place of the latter, 2 lb. fustic. Boil up cool, enter the goods and boil for forty-five minutes.—*C.*

Reseda on Wool (50 lb.).—Boil for seventy-five minutes with ½ lb. chromate of potash, ½ lb. argol, ¼ lb. alum. Dye in a fresh water with ¼ lb. logwood, 1 lb. fustic and ¼ lb. camwood.—*C.*

Light Salmon on Yarn (100 lb.).—Oxalic acid, 7 lb.; tin crystals, 2 lb.; cochineal, 12 oz., and flavine, 3 oz. Boil, cool, enter and boil for three-quarters of an hour. By adding more flavine the shade may be turned to an orange and to a red by more cochineal.

Slate Braid.—One Bath.—100 lb. braid. Cleanse the vat with 2 lb. alum; add 10 lb. alum, 10 lb. Glauber salts, 1 lb. red tartar, 4 lb. indigo paste, 2 lb. orchil carmine (Pickhardt & Kuttroff), 1 oz. picric acid, ½ gal. sulphuric acid. Commence with 3 lb. indigo paste, 1½ lb. orchil carmine, ¾ oz. picric acid. Enter at 180° F., give it six turns, then add balance of drugs, bring to boil and give six turns to shade, dry slowly.

Note.—For a fresh vat, 20 lb. alum, 20 lb. Glauber salts and 1 gal. sulphuric acid will be required.

Slate on Wool (100 lb.).—Boil 4 lb. logwood, 2 oz. camwood, 1 lb. fustic, 2 oz. madder, 2 oz. sumac, 2 oz. indigo extract.—*C.*

Lighter Shade of Slate (100 lb.).—Boil for fifteen minutes 2 lb. logwood, 4 oz. camwood, 12 oz. fustic, 4 oz. madder, 4 oz. sumac, 2 oz. extract of indigo. Cool, enter, work well and boil for one hour. Sadden as above and boil for twenty minutes longer.—*C.*

Scarlet Braid (one bath).—100 lb. braid. Dissolve 5 lb. oxalic acid, 2½ lb. tin crystals, 6½ lb. cochineal, 6 oz. flavine. Enter at 180° F and boil for one hour, giving eight turns in that time.

Note 1.—Braids ought to be always well scoured, warm wash to avoid dark spots.

Note 2.—Do not use water containing lime.

Stone Color, Dark, on Wool (220 lb.).—Boil with 6½ lb. each fustic and madder. 13 lb. sumac and 2¼ lb. argol for an hour and a half: sadden with 3¼ oz. copperas and boil for three-quarters of an hour longer.—*C.*

Stone Color, Light (220 lb.).—Boil for an hour with 6½ lb. alum, half that weight of argol, 14¼ lb. ground logwood, 13¼ lb. sumac, 3¼ lb. ground fustic and 6½ lb. madder. Sadden with 19 oz. copperas, boiling for half an hour longer.—*C.*

Violet on Wool (55 lb.).—Dissolve 4½ oz. methyl violet of a suitable shade in water. Add the solution to the beck, in which 2 lb. 3 oz. of sulphate of soda are also dissolved. Boil up, cool, enter the wool and dye at a brisk boil.—*C.*

Pansy on Yarn, for Fulling (54 lb.).—Make up a water with ½ lb. perchloride of tin and the same weight of sulphuric acid. Add a clear solution of methyl violet as required. Enter, dye at a boil, rinse and dry.—*C*

Bluish Pansy on Alpaca (100 lb.).—Prepare at a boil with 8 lb. alum, 3 lb. choride of tin, 2 lb. oil of vitriol and 2 oz. aniline blue of a reddish shade, and then top with 8 oz. reddish aniline blue and 2 oz. magenta.—*C.*

Pansy on Cloth (100 lb.).—Give a light blue ground in the vat, rinse and boil for ninety minutes with 10 lb. alum, 4 lb. argol, ½ lb. tin crystals, 1 lb. oil vitriol.

Top at a boil in a fresh water with 20 lb. logwood, 5 lb. redwood, and the solution of 3 to 6 lb. aniline violet.—*C.*

Pansy for Vicuna (10 lb.).—Enter the clean yarn in a boiling water with 1 lb. tannin, and steep for four to five hours. Wring and steep for two hours in bichloride of tin at 2½° Tw. Rinse, wring and dye to shade in methyl violet BBBB at a hand heat.—*C.*

Gentiana Violet on Wool (11 lb.).—Dissolve in a water 7 oz. argol and the necessary amount of color, previously dissolved; boil and skim. The goods are entered, and after three turns the shade is level. The color is dissolved in water at 140° F., and quickly raised to a boil, which is kept up for five minutes. The solution is then strained. One pound of color requires 30 lb. (3 gal.) of water.—*C.*

Violet 2 B on Worsted Yarn (50 lb.).—Dissolve 4 oz. violet 2 B (Bindschedler & Busch) in water at 180° F. Enter, give four to six turns while raising to 212° F., and boil to shade.—*C.*

Purple on Wollen Yarn (50 lb.).—Dissolve 5 lb. sulphate of soda and 5 oz. Violet de Paris 350 NB (A. Poirrier, of Paris). Cool down to 150° F., enter quickly, bring to a boil, and turn to shade.—*C.*

Violet on Woolen Yarn (50 lb.)—Dissolve in water 5 oz. violet No. 28 (Reid, Halliday & Sons, Huddersfield). Enter yarn at 150° F., turn briskly while raising to a boil. Let cool, and wash.—*C.*

Violet on Woolen Yarns (11 lb.).—Dye with methyl violet, adding 3¾ oz. prepared tartar. The use of this latter ingredient prevents smearing.—*R.*

Violet on Yarn (50 lb.).—Dissolve 5 lb. sulphate of soda, 7 oz. "acid violet" (Farbwerke, Hoechst am Main), and 1 lb. oil of vitriol. Enter at 150° F., turn briskly, raise to a boil, and work for three-quarters of an hour.—*C.*

Violets on Woolen Yarn (100 lb.).—The violets "5 B," "3 B" and "R R," of Monnet & Co., of Geneva, are dyed by simply dissolving in water at 180° F., entering, giving six or eight turns while raising water to a boil, and boiling to shade. Half a pound of each of the above colors gives a full shade.—*C.*

Alkali Violet on Wool (30 lb. yarn).—Dissolve ¼ lb. borax and 5 oz. alkali violet (Farbwerke, Hoechst am Main). Enter at 140° F., give four turns rapidly, raise to a boil, lift when dark enough, wash and raise in a fresh lukewarm water with ¾ lb. oil of vitriol. The process is the same as for Nicholson blues.—*C.*

Deep Dahlia on Piece Goods (100 lb.).—Make up a boiling water with 6 lb. alum, 1½ lb. bichromate, ¾ lb. tin crystals and 1 lb. oil of vitriol. Work in this for half an hour, and either wash or leave in the beck. Then dye with 50 lb. logwood, 10 lb. calliatura and 2 lb. orchil.—*C.*

Very Deep Violet on Piece Goods (100 lb.)—Make up a water with 1½ lb. chromate, 3 lb. alum, ½ lb. tin crystals, ½ lb. sulphuric acid and ¾ lb. oxalic acid. Work in this at a boil, and rinse and let cool in the flot and then boil for an hour and a half with 40 lb. logwood, 12 lb. calliatura and 2 lb. orchil.—*C.*

Fast Lilac on Wool (110 lb.).—Boil for an hour with 11 lb. peachwood, 5½ lb. logwood, 22 lb. alum and 11 lb. argol. Lift, and add 34 oz. bichloride of tin and boil for a quarter of an hour longer. To brighten the color, the solution of 3½ oz. methyl violet is added.—*C.*

Light Lilac on Worsted (25 lb. yarn).—Clear the water, if needful, and add 5 lb. sulphate of soda, 2 oz. red argol, 1 lb. sulphuric acid, ½ oz. violet (Farbwerke, Hoechst am Main) and 1½ oz. each of indigo extract and orchil extract.

Lemon Yellow on Wool (218 lb.).—Boil up 83 lb. fustic, 13 lb. 2 oz. alum, the same weight of tartar, 1¾ lb. tin crystals. Skim the beck, enter, and boil the wool for one and a half hours.—*R.*

Yellow (50 lb. yarn).—Dissolve in a water 5 lb. sulphate of soda crystals and ¼ lb. "Jaune S" (A. Poirrier, of Paris). Add 2 lb. oil of vitriol. Enter at 180° F. and give five turns while raising to 212° F. Boil for five minutes, wash and dry.—*C.*

Ocher Yellow on Wool (220 lb.).—Boil with 5½ lb. chromate of potash and half the weight each of bluestone and argol, for ninety minutes. Dye in a beck make up of ½ lb. French extract of fustic and 3¼ lb. madder, boiling for an hour.—*C.*

Aurantine Yellow (128 lb.).—Dissolve 1 lb. aurantine, 8 lb. alum, 2 lb. tartar, 8 lb. muriate of tin, ½ lb. tin crystals. Boil ten minutes. Cool, enter, turn ten minutes and boil half an hour. Rinse and dry.—*C.*

Deep Yellow (100 lb.).—Dissolve 1 lb. aurantine, 2 lb. alum, 2 lb. tartar, 8 lb. muriate of tin, ½ lb. tin crystals. Work as above.—*C.*

Light Yellow (64 lb.).—Aurantine ¼ lb., alum 3 lb., half refined tartar 2 lb., muriate of tin, 6 lb., tin crystals, 6 oz. Work as above.—*C.*

Yellow on Shoddy (100 lb.).—Clear the water with perchloride of tin and boil 50 lb. bark for half an hour. Add ½ lb. white glue, previously dissolved; boil up and skim. Dissolve in the clear liquor 3 lb. oxalic acid, 3 lb. tin salt and 1 lb. bichloride of tin. Boil the goods for an hour.—*C.*

Straw Color on Yarn (10 lb.).—Boil for forty-five minutes with 6 oz. alum, 3 oz. argol, ½ lb. fustic and ½ lb. madder.—*C.*

Berlin Yellow (50 lb. yarn).—Dissolve in a water 5 lb. alum and ¼ lb. Berlin yellow (Bindschedler & Busch). Enter at 170° F., give five turns while raising to a boil and turn to shade.—*C.*

Fast Yellow (50 lb.).—Make up a water with 2½ lb. sulphuric acid and ½ lb. fast yellow (Reid, Halliday & Sons, Huddersfield). Enter at 160° F. Raise to boil, turning to shade, and wash.—*C.*

Jaune d'Or on Yarn (100 lb.).—Prepare water at 160° F., with 1 lb. Jaune d'Or (Monnet & Co., Geneva) and 1 lb. acetic acid. Add only half the color and the acid. Enter yarn, work for thirty minutes, lift and add remainder of color and acid. Re-enter, work for thirty minutes more, raising the temperature to 180° F., wash and dry.—*C.*

Golden Yellow on Worsted (25 lb.).—Add to a water ¾ lb. of oil of vitriol, 3 lb. sulphate of soda, ½ lb. alum. Boil up, skim carefully if needed, add solution of ½ oz "golden yellow" (Clayton Aniline Co., Manchester), cool down to 160° F. and enter. Turn briskly, raise temperature and work to shade.—*C.*

Dark Golden Carmelite on Worsted (50 lb.).—Dissolve in a water 5 lb. sulphate of soda, 1 lb. alum, 1 lb. oil of vitriol, 6 oz. "dark golden carmelite" (Clayton Aniline Co., Manchester). Enter yarn at 150° F., raise to a boil, and work to shade.—*C.*

Naphthal Yellow on Worsted (30 lb. yarn).—Boil 5 lb. sulphate of soda, ½ lb. oil of vitriol, ¾ oz. naphthal yellow (Baden Aniline Co.). Enter at 160° F., raise to a boil and turn to shade.—*C.*

Aventurine on Half Woolens (4 lb. 6 oz.).—Sulphate of soda 2 lb. 3 oz., sulphate of alumina 4 lb. 6 oz., orchil 1 piggin, turmeric 13 lb. 2 oz. Dye, wash, and then pass into a catechu beck with bichromate of potash and turmeric.—*C.*

Porcelain White on Wool (218 lb.).—Clear the water with 2 lb. 3 oz. perchloride of tin at the heat of 100° F., add 1¾ oz. neutral extract of indigo and 2¾ oz. cudbear, and work the wool for half an hour.—*R.*

Mixed Goods.—Black on Common Mixed Carpet Yarn for Filling.—100 lb. yarn. Prepare 25 lb. extract of logwood, 6 lb. blue vitriol, and 6 lb. sal soda. Boil up, enter yarn, give three turns slowly, take up, wash, and it is finished.

Note 1.—The second 100 lb. requires only 15 lb. extract of logwood, 6 lb. blue vitriol, and 6 lb. sal soda. 2.—The third 100 lb. requires only 10 lb. extract of logwood, 4 lb. blue vitriol, and 4 lb. sal soda, and keep it for future use. 3.—This is a fair black, and size may be worked with it.

Green on Mixed Garments (11 lb.).—The wool is dyed green by boiling for one hour with 2 lb. 3 oz. alum, 8¾ oz. argol, 4½ oz. sulphuric acid, 2 lb. 3 oz. fustic, and 6¼ oz. extract of indigo. It is then entered in a beck at 190° F., with 17¼ oz. alum and the same weight of fustic. Here the goods are worked for an hour, lifted, wrung out, and entered in a fresh beck of 2 lb. 3 oz. sumac. Here they are soaked for two hours, turning frequently, lifted, wrung well out, and dyed in a fresh cold beck with methyl green. If the shade has to be darkened, decoction of logwood is added as required.—*R.*

Gray for Half Woolen Garments (11 lb.).—Prepare for three hours with 2 lb. 12 oz. sumac, wring out and boil for three quarters of an hour with 4½ oz. logwood and 1 oz. fustic. Sadden in the same beck with 1¾ oz. copperas at 200° F.—*R.*

Cheap Black on Mixed Cotton and Wool Cloth.—Boil in a bath of logwood extract, 25%; fustic extract, 4%; soda, 13%; bluestone, 8%. Work at 120° F. for some minutes, then raise to boiling, until a good black is got, after which enter in a new bath containing bichromate of potash, 4%.—*R.*

Pansy on Shoddy (109 lb.).—Prepare with 2 lb. 3 oz. chrome alum, 2 lb. 3 oz. sulphuric acid, and ¾ oz. chloride of tin. Then dye to shade with aniline violet (soluble in alcohol).—*R.*

Green for Half Woolen Garments (11 lb.).—Make up a beck with 17¼ oz. alum, 8¾ oz. argol, 17¼ oz. fustic, and 3½ oz. extract of indigo. Boil the goods in this for an hour, rinse, prepare with 3¼ lb. sumac, wring out and top in a fresh cold beck with 1¾ oz. methyl green.—*R.*

Earache, Cure for.—1. Wet a piece of cotton with equal parts of chloroform and laudanum, place in the ear, and cover up.

2. Put five drops of chloroform on a little cotton or wool in the bowl of a clay pipe, then blow the vapor through the stem into the aching ear.—*Med. Record.*

Earth, Slopes of.—The natural slopes of earths, with horizontal line, are as follows: Gravel (average), 40°; dry sand, 38°; sand, 22°; vegetable earth, 28°; compact earth, 50°; shingle, 39°; rubble, 45°; clay, well drained, 45°; clay, wet, 16°.

Earthenware, to Drill.—Use a steel drill, ground at the cutting end into a triangular-based pyramid. Turn the tool rapidly, and aid the action by the application of a solution of camphor in turpentine. If no such drill can be obtained, make one out of an old three-square file, thus: Soften it and file up until the edges are sharp, then temper. The extreme tip may advantageously be made with a greater angle.

Earthenware, Glazes for. See **Glazes.**

Earthenware, Varnish for. See **Varnishes.**

Earth Flax, Amianthus. See **Asbestos.**

Eau de Naples. See **Waters.**

Eau de Vie de Dantzick. See **Liquors.**

Eau Romaine. See **Waters.**

Eau Sedative. See **Waters.**

Eaux. See **Waters.**

Ebonite and Vulcanite.—The only difference between these two articles is in the coloring materials used. These terms are applied to a compound of India rubber and sulphur, exactly the same as the common elastic bands, the only difference being in the time and heat required to vulcanize or harden the compound. 1. Sulphur, 2 to 3 parts, is mixed with caoutchouc, 5 parts, and cured for several hours at 75° C., under a pressure of four to five atmospheres. Ebonite is apt to become porous and conductive in moist air or in sunlight. It keeps best when dry and in the dark. Heat softens and deforms it. To prevent loss of insulation by oxidation of the sulphur, the surface should be washed from time to time with boiling water, then rinsed with distilled water, and dried. The surface should be shellaced or paraffined, especially in moist climates.

2. *Hard Good Quality.*—Best Para rubber, 2 parts; sulphur, 1 part, by weight.

3. *American Ebonite.*—Rubber, 12 parts; sulphur, 8 parts; whiting, 1 part; wash, 1 part, by weight. Curing moulds for above: lead, 2 parts; antimony, 1 part, by weight.

4. *Soft Vulcanized India Rubber.*—Para rubber, 7·5 parts; sulphur, 0·75 parts; lime, 0·01 parts; whiting, 7·5 parts; French chalk, 1·25 parts; litharge, 1·5 parts, by weight.

Ebonizing Wood. See **Staining.** *Wood.*

Ebony, Artificial.—60 parts of charcoal obtained from seaweeds previously treated with dilute sulphuric acid, and dried, and mixing it with 10 parts of liquid glue, 5 of gutta percha, and 2½ of India rubber, care having been taken to mix the two latter substances with coal oil tar to render them gelatinous; then 10 parts of coal tar, 5 of pulverized sulphur, 2 of powdered alum, and 5 of powdered resin are added, and the mixture heated to 300° F. After having been cooled a substance is obtained which is equal in many respects to genuine ebony wood, but is far less expensive, and capable of receiving a finer polish. It can only be prepared on a large scale.

Ebony, Imitation.—The wood is immersed for forty-eight hours in a hot saturated solution of alum, and then brushed over several times with a logwood decoction prepared as follows: Boil 1 part best logwood with 10 parts of water, filter through linen and evaporate at a gentle heat until the volume is reduced one half. To every quart of this add from 10 to 15 drops of a saturated solution of indigo, completely neutral. After applying this dye to the wood, rub the latter with a saturated and filtered solution of verdigris in hot concentrated acetic acid, and repeat the operation until a black of the desired intensity is obtained.

Ebony, to Polish. See **Polishing.**

Ectypography.—Etching in relief.

Edulcoration.—The affusion of water on any substance for the purpose of removing the portion soluble in that liquid. Edulcoration is usually performed by agitating or triturating the article with water, and removing the latter after subsidence by decantation or filtration. It is the method commonly adopted to purify precipitates and other powders which are insoluble in water. The washing bottle is a most useful instrument for the edulcoration of precipitates.

Effervescence.—The rapid escape of gas in small bubbles from a liquid.

Efflorescence.—When a crystallized salt parts with its water of crystallization by exposure to the air, and crumbles into a powder, it is said to "effloresce." The spontaneous conversion of a crystalline solid into a dry pulverulent form. Crystals which, in a dry atmosphere, lose their water of crystallization and become crusted over with a mealy powder are said to be efflorescent.

Egg Drink.—The following drink for relieving sickness of stomach was introduced by Dr. Halahan, and is very palatable and agreeable: Beat up one egg very well, say for twenty minutes, then add fresh milk, 1 pt.; water, 1 pt.; sugar, to make it palatable; boil and let it cool; drink when cold. If it becomes curds and whey it is useless.

Egg-Nog, or Auld Man's Milk.—Separate the whites and yelks of a dozen fresh eggs. Put the yelks into a basin and beat them to a smooth cream with half a pound of finely pulverized sugar. Into this stir ½ pint of brandy, and the same quantity of Jamaica rum; mix all well together and add 3 qt. of milk or cream, half a nutmeg (grated), and stir together. Beat the whites of the eggs to a stiff froth; stir lightly into them 2 or 3 oz. of the finest sugar powder, add this to the mixture, and dust powdered cinnamon over the top.

Egg Flip.—Beat up in a bowl ½ doz. fresh eggs; add ½ lb. pulverized sugar; stir well together, and pour in 1 qt. or more of boiling water, about ½ pt. at a time, mixing well as you pour it in; when all is in, add two tumblers of best brandy and one of Jamaica rum.

Eggs, *to Tell the Age of.*—This method is based upon the decrease in the density of eggs as they grow old. Dissolve 2 oz. of kitchen salt in a pint of water. When a fresh laid egg is placed in this solution it will descend to the bottom of the vessel, while one that has been laid on the day previous will not quite reach the bottom. If the egg be three days old it will swim in the liquid, and if it is more than three days old it will float on the surface, and project above the latter more and more in proportion as it is older.—*La Nature.*

To Pack Eggs to Keep for Winter.—1. Dip the eggs into a solution of 2 oz. gum arabic in a pint of cold water, let them dry and pack in powdered, well burned charcoal.

2. Packing Liquid.—Lime, 1 bushel (slaked with water); common salt, 2 or 3 lb.; cream of tartar, ½ lb.; water q. s. to form a mixture strong enough to float an egg. Used to preserve eggs, which it is said it will do for two years, by simply keeping them in it.

3. In the common "liming" process a tight barrel is half filled with cold water, into which is stirred slaked lime and salt in the proportion of about ½ lb. each for every pail or bucket of water. Some dealers use no salt, and others add a small quantity of niter—¼ lb. to the half barrel of pickle. Into this the eggs, which must be perfectly fresh and sound, are let down with a dish, when they settle to the bottom, small end down. The eggs displace the liquid, so that when the barrel is full of eggs it is also full of the pickle. Eggs thus pickled, if kept in a cool place, will ordinarily keep good for several months. Long storage in this liquid, however, is apt to make the shells brittle and impart a limy taste to their contents. This may be in a great measure avoided by anointing the egg all over with lard before putting in the pickle. Eggs thus prepared are said to keep perfectly for six months or more when stored in a cool cellar.

4. A much better method of storing eggs is the following: Having selected perfectly fresh eggs, put them, a dozen or more at a time, into a small willow basket, and immerse this for five seconds in boiling water containing about 5 lb. of common brown sugar per gal. of water. Place the eggs immediately after on trays to dry. The scalding water causes the formation of a thin skin of hard albumen next the inner surface of the shell, the sugar effectually closing all the pores of the latter.

The cool eggs are then packed, small end down, in an intimate mixture of one measure of good charcoal, finely powdered, and two measures of dry bran. Eggs thus stored have been found perfectly fresh and unaltered after six months.

5. A French authority gives the following: Melt 4 oz. clear beeswax in a porcelain dish over a gentle fire and stir in 8 oz. of olive oil. Let the resulting solution of wax in oil cool somewhat, then dip the fresh eggs one by one into it so as to coat every part of the shell. A momentary dip is sufficient, all excess of the mixture being wiped off with a cotton cloth. The oil is absorbed in the shell, the wax hermetically closing all the pores. It is claimed that eggs thus treated and packed away in powdered charcoal in a cool place have been found after two years as fresh and palatable as when newly laid.

6. Paraffine, which melts to a thin liquid at a temperature below the boiling of water, and has the advantage of being odorless, tasteless, harmless, and cheap, can be advantageously substituted for the wax and oil, and used in a similar manner.

Thus coated and put into the lime pickle the eggs may be safely stored for many months; in charcoal, under favorable circumstances, for a year or more.

7. Dry salt is frequently recommended as a good preservative packing for stored eggs, but practical experience has shown that salt alone is but little better than dry bran, especially if stored in a damp place or exposed to humid air.

8. A mixture of 8 measures of bran with 1 of powdered quicklime makes an excellent packing for eggs in transportation.

9. Water glass—silicate of soda— has recently been used in Germany for rendering the shells of eggs non-porous. A small quantity of the clear sirupy solution is smeared over the entire surface of the shell. On drying, a thin, hard glassy film remains, which serves as an admirable protection and substitute for wax, oil, gums, etc. Eggs thus coated and stored in charcoal powder or a mixture of c arcoal and bran would keep a very long time.

10. In storing eggs in charcoal the latter should be fresh and perfectly dry. If the eggs are not stored when perfectly fresh they will not keep under any circumstances. A broken egg stored with sound ones will sometimes endanger the whole lot. In packing, the small end of the egg should be placed downward; if in charcoal or other powder they must be packed so that the shell of one egg does not touch that of another, the interspaces being filled with the powder.

Under all circumstances stored eggs should be kept in as cool a place as possible. Frequent change of temperature must also be avoided.

Elaterite, Elastic Bitumen.—A mineral pitch occurring in fungoid masses. It looks much like India rubber, and effaces lead pencil marks, hence it obtained the name of mineral caoutchouc.

Elderberry Wine. See **Wines.**

Electric Machines, Amalgam for. See **Amalgams.**

Electro-Chemical Printing Solution (Bain's).—Saturated solution of potassium ferro-cyanide 1 vol., water 2 vols.; or, saturated solution of ammonium nitrate 1 vol., water 2 vols.

Electrolytic Classification of Elements.—This table indicates the electric relations of simple or elementary bodies to each

other, but is subject to modifications, and indeed, reversal of order, according to the nature of the exciting fluid in which the pairs of elements may be immersed. In the first column of negative bodies each element is to be considered negative to all below, and positive to all above it, and the same applies to the second column of positive bodies. The elements are therefore negative or positive only in relation to each other.

Electro-Negative Elements.

Oxygen.	Iodine.	Carbon.
Sulphur.	Phosphorus.	Antimony.
Selenium.	Arsenic.	Tellurium.
Nitrogen.	Chromium.	Titanium.
Fluorine.	Vanadium.	Silicon.
Chlorine.	Tungsten.	Hydrogen.
Bromine.	Boron.	

Electro-Positive Elements.

Potassium.	Uranium.	Tin.
Sodium.	Manganese.	Bismuth.
Lithium.	Zinc.	Copper.
Barium.	Iron.	Silver.
Strontium.	Nickel.	Mercury.
Calcium.	Cobalt.	Palladium.
Magnesium.	Cadmium.	Platinum.
Aluminum.	Lead.	Gold.

—*Watt.*

Electro-Metallurgy.—Electro-metallurgy has two departments, which are distinguished by the preparation of the surfaces to be coated.

Electro-plating is the production of adhesive deposits, and depends on the absolute cleanness of the metal surface coated. This will be treated first.

Electrotyping is the production of removable deposits from either non-metallic moulds or from metal surfaces, whose cleanness is destroyed either by black-leading or by rubbing with turpentine containing a trace of wax. The preparation of the objects depends (1) upon class of deposit required; (2) upon the nature of the object itself. In all cases, ordinary dirt, rust, etc., must be removed, as the deposit reproduces every feature of the surface, even to a finger mark.

Cleansing.—Copper, brass, zinc and the noble metals are cleaned by the suitable acids which act on them. Such cleaning solutions may be prepared for different metals as follows:

	Water.	Nitric.	Sulphuric.	Hydrochloric.
For copper and brass	100	50	100	2
Iron	100	3	8	2
Iron (cast)	100	3	12	3
Zinc	100	..	10	..
Silver	100	10	.	..

It is best to make two such solutions, one being reserved for a final dip, during which a strong action occurs upon the surface. As this becomes weaker it can be used for the first cleansing, accompanied by occasional rubbing with sand, etc., according to the nature of the object.

Lead, tin and pewter must not be placed in acid, but are cleaned by aid of caustic soda.

Objects must be carefully freed from acids if they are to be transferred to silver or gold solutions, but less care is necessary for objects cleaned in soda, nor is the same care necessary in transferring objects cleaned in acids to an acid coppering solution. In such cases the best plan is to dip into clean water and at once transfer to the depositing cell.

Cleansing and Preparing Objects for Electroplating.—The first and most important operation in the electro-deposition of one metal upon another is to effect a thorough chemical cleansing of the surface of the metal upon which the coating is to be deposited, for if this is not accomplished the deposited metal will not adhere to the surface.

In cleansing, different metals usually require a somewhat different treatment.

The surface of most metals when clean soon becomes coated with a film of oxide when exposed to the air, especially when the surface exposed is wet, and to avoid this it is usually necessary to proceed with the plating immediately after cleansing.

Before proceeding to cleanse the articles they are usually "trussed" with copper wire to avoid the necessity of handling them during the operation or afterward, until the plating is finished. A very slight contact with the hand is often sufficient to make a second cleansing necessary.

If the article to be plated presents a smooth finished or polished surface the deposit will be "bright." If, on the contrary, the surface is rough or unpolished, the deposit will ordinarily have a dead luster. If left too long in the acid dips used in cleansing, the polished surface is apt to have its finish deadened.

No interval should be allowed between the various operations of cleansing.

Cleansing Copper and Copper Alloys.

Potash, caustic..... .....1 lb.
Water, soft.....1 gal.

Heat nearly to boiling in a cast iron pot provided with a cover.

Brush to remove any loosely adhering foreign matters, truss and suspend for a time in the hot lye; usually a few minutes will suffice if the article is not heavily lacquered. If any of its parts are joined with solder it should not be allowed to remain too long immersed, as the caustic liquid attacks solders and their solution blackens copper. On removing, rinse thoroughly in running water.

If the articles are much oxidized, pickle in a bath composed of—

Water..... .1 gal.
Sulphuric acid..... .....1 pt.

until the darker portion is removed. Rinse in running water and dip in the following solution:

Water, soft..... .1 gal.
Cyanide of potassium, common...8 oz.

Remove from the bath and quickly go over every part with a brush and fine pumice stone powder moistened with the cyanide solution. Some electroplaters prefer to give the articles a preliminary "brightening" dip in nitric acid, or a mixture of nitric and sulphuric acids and salt, followed by rinsing in water, but the cyanide, aided by the mechanical action of the pumice and brush, does very well without it in most cases. After the scouring dip the work momentarily in the cyanide solution, rinse quickly in running water, and transfer immediately to the plating bath.

Where the article is to receive a deposit of gold or silver its surface is usually softened by slightly amalgamating it with mercury, to insure perfect adhesion of the deposited metal.

The *amalgamating is performed by dipping* the article, after the *cyanide scouring operation*, for a few seconds in a solution of—

Mercuric nitrate.. ... .½ oz.
Sulphuric acid..... ...½ oz.
Water.... ....1 gal.

Stir until the solution becomes clear before using. Rinse the work quickly on coming from the mercury dip, and transfer to the plating solution.

The acid, cyanide and mercury dips may be kept in glass or stoneware jars (avoid jars with lead glazing) provided with covers to prevent evaporation.

A "dead luster" is imparted to articles of copper or copper alloy by dipping them for a few minutes in a bath composed of—

Nitric acid (36°)	20 lb.
Sulphuric acid (66°)	10 "
Salt	½ "
Zinc sulphate	½ "

Mix the acids gradually, add the zinc salt, then the salt, a little at a time (out-of-doors to avoid the acid vapors), stir well together, and let it get cold before using. Rinse thoroughly, and pass through the cyanide before putting in the plating bath.

Cleansing Cast Iron.

Cast iron is freed from grease, etc., by dipping in hot alkali solution used for a similar purpose with copper, and after rinsing thoroughly is pickled in water containing abut 1% of sulphuric acid for several hours; then rinsed in water and scoured with fine sharp sand or pumice and a fiber brush. It is then rinsed and returned to the acid pickle for a short time, rinsed again and put into the plating bath directly. If more than 1% of acid is used in the pickle the time of immersion must be shortened, otherwise the iron will be deeply corroded, and the carbon which the metal contains, and which is not affected by the acid, will not yield without a great deal of labor to the sand and brush.

Cast iron does not gild or silver well by direct deposit. Copper or bronze deposits are better, though not perfect; but if the iron is tinned the coat is adherent and will readily receive the other metals.

Cleansing Wrought Iron.

The cleansing of wrought iron, if much oxidized, is effected in the same manner as cast iron; but it will bear a stronger pickle and a longer exposure. Whitened, filed, or polished iron may be treated like steel.

Cleansing Steel.

Dip in the caustic lye used for copper, etc., rinse thoroughly, scour with pumice powder moistened, rinse and pass through the following dip:

Water	1 gal.
Hydrochloric acid	4 lb.

Rinse quickly (but thoroughly) and plunge in the bath.

Clean wrought iron and steel gild well without an intermediary coating in hot electro gilding baths. It is difficult to obtain an adherent coating of silver on these metals without interposing an intermediate coating of copper or brass, which renders the further operation of silver plating easy.

Cleansing Zinc, Tin and Lead.

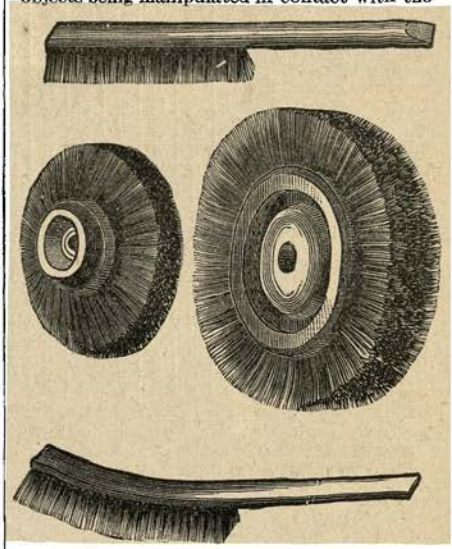
Zinc is cleansed by dipping for a few moments only (as the alkali quickly attacks the metal) in the hot potash lye, rinsing and dipping into water containing about 10% of sulphuric acid for a few minutes. Rinse in plenty of hot water, and, if necessary, scour with pumice stone powder and a stiff brush, moistened with a weak cyanide solution or scratch brush. This last operation is especially useful when parts have been united with tin solder.

Tin, lead and the alloys of these metals are more difficult to cleanse perfectly than zinc or iron. Scour rapidly with the hot potash and brush, rinse quickly and brush, or dress with a piece of soft clean wood. It is very difficult to obtain a satisfactory deposit of gold or silver directly upon these metals or their alloys. The results are much better if a coating of pure copper is interposed.

Scratch Brushing.

The scratch brush is often resorted to to remove the dead luster on or to impart a smooth surface to an object. They are usually made of brass or steel wire, and of a variety of shapes to suit the object. Some of the forms are shown in the annexed cut.

The wheel brushes are used on the lathe, the objects being manipulated in contact with the



rapidly revolving brush. The brush is usually kept moistened by a small stream of water while in use.

Dipping Acid.—This name is given to a mixture which is frequently used for imparting a bright surface to brass work. When required for dipping brass work preparatory to nickel-plating it is commonly composed of: Sulphuric acid, 4 lb.; nitric acid, 2 lb.; water, 2 qt. In making the above mixture the nitric acid is first added to the water, and the sulphuric acid (ordinary oil of vitriol) is then to be gradually poured in, and the mixture stirred with a glass rod. When cold it is ready for use. The mixture should be kept in a stoneware vessel, which should be covered with a sheet of stout glass. The dipping should always be conducted either in an outer yard or near a fireplace, so that the fumes may escape, as they are exceedingly irritating to the lungs when inhaled. The instant the articles are removed from the dipping bath, they should be plunged in a vessel of water.

Pickling Bath.—Cast iron before being nickeled requires to be placed in a cold acid solution or "pickle" to dissolve or loosen the oxide from its surface. The pickle may be prepared in a wooden tub or tank from either of the following formulæ: Sulphuric acid (oil of vitriol), ½ lb.; water, 1 gal. Cast iron work immersed in this bath for twenty minutes to half hour will generally have its coating of oxide sufficiently loosened to be easily removed by means of a stiff brush, sand and water. When it is desired that the articles should come out of the bath bright instead of the dull black color which they present when pickled in the plain sulphuric acid bath the following formula may be adopted: Sulphuric acid, 1 lb.; water, 1 gal. Dissolve in the above 2 oz. of zinc, which may conveniently be applied in its granulated form. When dissolved add ½ lb. of nitric acid and mix well.

The greatest care should be used in cleansing or pickling before nickeling. The fine iron work which is made at Wernigerode and other places in the Hartz Mountains, is believed to be cleansed in this manner. Work of this class is inexpensive and is very artistic.

Deposition by Simple Immersion, Tabular Examples of.

Solution. / Metal.	Antimony.	Arsenic.	Bismuth.	Brass.	Cadmium.	Cobalt.	Copper.	Gold.	German Silver	Iron.	Lead.	Platinum.	Palladium.	Manganese.	Mercury.	Nickel.	Silver.	Tin.	Zinc.
Antim. terchloride.	n	o	d	d	o	o	o	n	d	o	d	n	o	o	o	n	n	d	d
Bismuth chloride...	n	o	n	n	o	o	n	n	n	d	d	n	o	o	o	o	o	d	d
Copper sulphate....	n	o	n	o	o	o	n	n	o	d	d	n	o	o	o	n	n	d	d
Copper nitrate.....	n	o	n	o	o	o	n	n	o	d	d	n	o	o	o	n	n	d	d
Copper chloride...	n	o	d	o	o	o	n	n	o	d	d	o	o	o	o	n	n	d	d
Copper dichloride..	n	o	n	o	o	o	n	n	o	n	n	n	o	o	o	n	n	d	d
Gold terchloride....	d	d	d	d	d	d	d	n	d	n	d	d	d	d	d	n	d	n	d
Gold double cyanide	n	o	n	d	o	o	d	n	d	n	n	n	o	o	o	n	n	n	D
Mercury nitrate....	d	o	d	o	d	o	d	n	o	d	d	n	o	o	o	o	n	o	d
Mercurous salts...	d	d	d	d	d	o	d	n	o	d	d	o	o	o	o	o	d	d	d
Platinum chloride..	d	d	d	d	d	d	d	n	d	d	d	n	o	o	d	o	d	d	d
Lead nitrate acetate	n	o	n	n	o	o	n	n	n	n	n	n	o	o	o	n	n	n	d
Silver nitrate.....	d	d	d	d	o	o	d	n	d	D	n	o	o	d	o	d	n	D	d
Silv alcoholic nitrate	d	o	d	d	o	o	d	o	d	n	o	o	o	o	o	o	o	d	d
Silv. double cyanide	n	o	n	d	o	o	D	n	d	n	D	n	o	o	o	n	n	n	D
Tin chloride.....	n	o	n	n	o	o	n	n	n	n	n	d	n	o	o	n	n	n	d
Zinc salts.....	n	o	n	n	o	o	n	n	n	n	n	d	n	o	o	o	n	n	n

References.

d. Deposition. n. No deposition. o. Not observed. D. Quickly deposited.

Aluminum.—1. Aluminum may be deposited on copper from a dilute solution of the double chloride of aluminum and ammonia.

2. Aluminum is one of the most difficult and uncertain of metals to deposit electrolytically. The following recipe is given by Herman Reinbold, who states that it furnishes excellent results: Fifty parts by weight of alum are dissolved in 300 of water and to this is added 10 parts of aluminum chloride. The solution is heated by 200° F., and when cold 39 parts of cyanide of potassium are added. A feeble current should be used.

3. Dissolve in distilled water the required quantity of aluminum, either the sulphate, muriate, nitrate, acetate or cyanide. Concentrate this solution to 20° Baume. Use 3 pairs Bunsen's zinco-carbon cells, connected for intensity. Attach an anode of aluminum to the negative wire. Acidulate the solution slightly with the appropriate acid heated to 140° F. Keep the solution at this temperature during the operation.

Antimony, Deposition of.—The galvanic deposition of antimony having been specially studied by Mr. Gore, we will borrow from him the description of the processes employed.

Antimony may be deposited by simple immersion and by means of an electric current; in the latter case the metal may not only be obtained in a state of loose black powder, but also in two distinctly different coherent reguline conditions, viz., as a very brittle metal of a gray slate color and hard crystalline structure; and also in a highly lustrous steel-black deposit of amorphous structure.

The solution used for obtaining the pure gray metal is composed of—

Distilled water.....	.....350 grm.
Tartar emetic.....	30 "
Tartaric acid.....	30 "
Pure hydrochloric acid....	45 "

It is not a good conductor and should be used with a current of about 1 volt, so as to deposit about 1 millimeter per week.

For obtaining a bright shining deposit the following solution can be used:

Sulphate of antimony.	.....500 grm.
Potassic carbonate...	1 kilo
Water...	8 liters.

Bismuth may be deposited from a slightly acid solution of the double chloride of bismuth and ammonia.

Brassing Solutions, De Salzede's. Processes.—1. Cyanide of potassium, 12 parts; carbonate of potassium, 610 parts; sulphate of zinc, 48 parts; chloride of copper, 25 parts; nitrate of ammonia, 305 parts; water, 5,000 parts. The cyanide is to be dissolved in 120 parts of the water, and the carbonate of potash, sulphate of zinc, and chloride of copper, are to be dissolved in the remainder of the water, the temperature of which is to be raised to about 150° F. When the salts are dissolved, the nitrate of ammonia is to be added, and the mixture well stirred until the latter is all dissolved. The solution should be allowed to stand for several days before using, and the clear liquor separated from any sediment that may have deposited at the bottom of the vessel.

2. Cyanide of potassium, 50 parts; carbonate of potassium, 500 parts; sulphate of zinc, 35 parts; chloride of copper, 15 parts; water, 5,000 parts. This solution is to be made up in the same way as No. 1.

3. Bronzing Solution. This solution is the same as No. 1, except that 25 parts chloride of tin are substituted for the sulphate of zinc.

4. Bronzing Solution. This is the same as No. 2, with the exception that 12 parts chloride of tin are substituted for the sulphate of zinc. This solution is worked warm, that is, at about 97° F.

Electro Deposition of Brass.—5-17. Brass has been deposited from a great variety of brassing solutions, as will be seen by reference to the annexed table. Among the first attempts to deposit brass, may be mentioned that of M. De Ruolz in 1841, who employed a mixed solution of the double cyanides of copper, zinc, and potassium. Cyanide of potassium forms an important ingredient in the majority of brassing solutions, but ammonia in some form is also necessary to keep the solutions in working order.

The following general conditions are to be observed in making up the solutions according to the proportions given in the foregoing table. Fluid ounces of liquids are intended and ounces avoirdupois for the solids. When potassium carbonate (carbonate of potash) is to be used, the copper and zinc salts are first dissolved in water and then precipitated as carbonates from this solution by adding a portion of the potassium carbonate. Where the sign q. s. is given in the foregoing table, a sufficient quantity of the ammonia or cyanide must be

Table of Brassing Solutions.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
Water	1280	5000	3200	5000	5000	800	160	160	250	1000	160	160
Copper acetate	5					160						
Copper carbonate											2	
Copper chloride		10	16	25	15							
Copper sulphate									1	25		4
Copper cyanide							2	2				
Zinc acetate						16						
Zinc carbonate											2	
Zinc cyanide							1	1				
Zinc sulphate	10	20	32	48	35				8	30		5
Potassium acetate						160						
Potassium carbonate		160	400	610	500							
Potassium cyanide	8	24		12	50	q. s.	15	16	18	q. s.	4	q. s.
Potassium caustic	72											
Ammonia liquid	50	q. s.										
Ammoniate carbonate								16				
Ammonia nitrate			200	305								
Soda carbonate										200	4	45
Soda bisulphite										50	4	7½
Arsenious acid											1/20	

added to produce the desired effect, ammonia being generally employed to dissolve the precipitates, forming a deep blue liquid, and cyanide being used until the blue color has all disappeared. Both are employed as solvents to the anodes, which will not freely dissolve unless one or both are present in the solution. Even when a brassing solution is made up without the use of cyanide and ammonia, it is necessary to add them afterward to keep the solutions in working order, as the ammonia alone does not freely dissolve the copper of the anode, and cyanide alone does not dissolve the zinc oxide formed on the anode. The following details apply to each numbered solution in the foregoing table.

1. Dissolve all the salts separately in portions of the water; add the ammonia in equal parts to the solutions of the copper and zinc salt with stirring; mix the copper and zinc solutions together, then add the caustic potash solution and lastly the cyanide solution; stir well at frequent intervals during the next twelve hours, then allow the solution to rest a short time before working it.

2. Dissolve all the salts separately; pour enough potash solution into the solutions of copper and zinc to precipitate all the metal; add ammonia until the precipitate has been dissolved; decolorize with the cyanide, then add remainder of potash and water.

3. Dissolve all separately; mix copper, zinc and potash solutions, then add the nitrate of ammonia.

4. Proceed in a similar manner as for No. 3 solution.

5. Proceed in a similar manner as for No. 3 solution.

6. Dissolve all the salts; add the cyanide solution to the others with stirring.

8. Dissolve all the salts in distilled water, mix together and add 2 oz. of sal ammoniac.

9. Dissolve all the salts separately, then mix together

10. Dissolve the copper and zinc salts and mix the solutions; add a solution of 100 parts of the carbonate of soda and stir well together; when the precipitate has subsided, pour off the clear liquor, wash the precipitate, add the remainder of the carbonate of soda together with the bisulphite of soda previously dissolved in water, then add enough cyanide to dissolve the precipitate.

11. Dissolve the zinc and copper salts in water, then add the other ingredients. Dissolve the arsenious acid in the hot cyanide solution before adding it to the other solutions.

12. Dissolve the copper and zinc salts in 1 gal. of water and precipitate them as carbonates with 30 oz. of carbonate of soda; drain off all the liquid, wash the precipitate, add the carbonate and bisulphite of soda, then stir in enough cyanide to make a clear solution.

18. The Brass Baths.—Where the ordinary cheap commercial cyanide is employed, the following answers very well:

Sulphate of copper	4 oz.
Sulphate of zinc	4 to 5 oz.
Water	1 gal.

Dissolve and precipitate with 30 oz. carbonate of soda; allow to settle, decant the clear liquid, and wash the precipitate several times with fresh water—after as many settlings. Add to the washed precipitates:

Carbonate of soda	15 oz.
Bisulphite of soda	7½ oz.
Water	1 gal.

Stir to effect solution of these last two, then stir in ordinary cyanide of potassium until the liquid becomes clear and colorless. Filter if much iron or iron oxide (derived from impure zinc salt and cyanide) remains suspended in the liquid. An additional ½ oz. or so of the cyanide improves the conductivity of the solution.

19. Cold Brass Bath for all Metals.

Carbonate of copper (recently prepared)	½ oz.
Carbonate of zinc	2 "
Carbonate of soda	4 "
Bisulphite of soda	4 "
Cyanide of potassium (pure)	4 "
Arsenious acid	1/20 "
Water	1 gal.

Filter if necessary.

The arsenious acid is added to brighten the deposit—an excess is apt to give the metal a grayish white color.

20. Management of the Bath.

The losses of the bath are to be repaired by the addition of copper and zinc salts (and arsenious acid) dissolved in fresh cyanide and water.

The operator determines the requirements from the rapidity of the deposit, its condition, color, etc.

The difficulty in brass electroplating, especially with small baths, is in keeping the uniformity of the color of the deposit, as the electric current, having to decompose two salts, each offering a different resistance, must, according to its intensity, vary the color and composition of the deposit. A feeble current principally decomposes the copper salt and results in a red deposit; while too great intensity in the current decomposes the zinc salt too rapidly and the deposit is a white or bluish

white alloy. If the deposit has an earthy or ocherous appearance, or if the liquid is blue or greenish, the solution is deficient in cyanide. When in proper working order the liquor is colorless. If the coating becomes dull and unequal, a slight addition of arsenious acid will usually improve it.

If the deposit is too red, use more battery power or add more zinc salt; if too white, decrease the current or add more copper salt. The specific gravity of the bath may vary from 5° to 12° Baumé; when it exceeds this latter gravity it should be diluted with fresh water to decrease the electric resistance.

If the brass deposit is irregular, remove the articles from the bath, rinse, scratch-brush, and put again into the bath until the color and thickness of the deposit are satisfactory. Scratch-brush again, and, if necessary, rinse in hot water, dry in warm white wood sawdust, and put in the stove room. The last three operations are indispensable for hollow pieces.

In the disposition of the brass plating bath it is always necessary to have all the articles suspended at about equal distances from the anodes.

The bath may be subdivided by several anodes, forming partitions, so that each loaded rod is between two anodes.

The anodes should always be removed when the bath is not in use.

In order that the brass electroplating of zinc or copper may be lasting the deposit must not be too thin, and must be scratch-brushed, washed in lime water, and dried in the stove room.

Generally ten to twenty-five minutes' exposure in the bath suffices in ordinary practice to throw on a good coating. Cast and wrought iron, lead and its alloys require a bath richer in the metals than when brass plating zinc or its alloys. The battery power should also be greater. For lead the bath works better warm (at about 90° F.). When once placed in the brass bath articles should not be moved about, as there is a tendency under such circumstances to the formation of a red deposit.

In brass plating wire the hot bath is usually employed. As before mentioned, the vessel containing the bath usually consists in an oblong open iron boiler, lined with sheet brass anodes, and heated by fire, steam, or hot water. A stout copper or brass rod in the direction of the length of the boiler rests upon the edges, from contact with which it is insulated by pieces of rubber tubing. The rod is connected with the zinc pole of the battery. The binding wires are removed from the coil, the wires loosened, and the ends bent together into a loop. The wire is then dipped into a pickle of dilute sulphuric acid, and hung upon a stout round wooden peg fastened in the wall, so that the coil may be made to rotate easily. After a scrubbing with wet sharp sand and a hard brush the coil is given a primary coating of copper. It is then suspended to the horizontal rod, where only a part of the coil at a time dips into the solution and receives the deposit. The coil is then turned now and then one-half or one-fourth of its circumference. By dipping the coil entirely into the liquid the operation is not so successful.

The wires are washed, dried in sawdust, and then in the stove room, and lastly passed through a draw plate to give them the fine polish of true brass wires.

The temperature at which the hot bath is commonly used varies between 130° and 140° F.

21. Sulphate of copper, 4 oz.; sulphate of zinc, 4 to 5 oz.; water, 1 gal. Dissolve and precipitate with 30 oz. of carbonate of soda; allow to settle, pour off the clear liquid and wash the precipitate several times in fresh water. Add to the washed precipitate carbonate of soda, 15 oz.; bisulphite of soda, 7½ oz.; water, 1 gal. Dissolve the above salts in the water, assisting the solution by constant stirring; then stir in ordinary cyanide of potassium until the liquid becomes clear and colorless. Filter the solution, and to improve the conductivity, an additional ½ oz. of cyanide may be given.

22. Russell & Woolrich's Process.—A solution is made of the following: Acetate of copper, 10 lb.; acetate of zinc, 1 lb.; acetate of potassium, 10 lb.; water, 5 gal. The salts are to be dissolved in the water, and as much of a solution of cyanide added as will first precipitate the metals and afterward redissolve the precipitate. An excess of cyanide is then to be added and the solution set aside to settle as before. A brass anode or one of zinc and another of copper may be used.

23. Wood's process consists in making a solution as follows: Cyanide of potassium (troy weight), 1 lb.; cyanide of copper 2 oz.; cyanide of zinc, 1 oz.; distilled water, 1 gal. When the ingredients are dissolved add 2 oz. sal-ammoniac. For coating smooth articles, it is recommended to raise the temperature of the solution to 160° F., using a strong current.

24. Morris & Johnson's Process.—A solution is made by dissolving in 1 gal. of water cyanide of potassium, 1 lb.; carbonate of ammonia, 1 lb.; cyanide of copper, 2 oz.; cyanide of zinc, 1 oz. The solution is to be worked at a temperature of 150° F., with a large brass anode and a strong current.

Bronze Baths.—1. Potassic cyanide, 50 parts; potassic carbonate, 500 parts; tin chloride, 12 parts; cupric chloride, 15 parts; water, 5,000 parts. This bath is used at a temperature not exceeding 36° C.

2. Bronzing Electro Brassed Work, Green Bronze.—Mix into a paste with water the following substances: Chromate of lead (chrome yellow), 2 oz.; Prussian blue, 2 oz.; plumbago, ½ lb.; sienna powder, ¼ lb.; lac carmine, ¼ lb. When applying the above composition a small quantity of sulphide of ammonium or chloride of platinum solution may be added.

3. Solutions for Depositing Brass or Bronze; Dr. Heeren's Process.—A brassing solution may be prepared by employing a large excess of zinc to a very small proportion of copper as follows: Sulphate of copper, 1 part; sulphate of zinc 8 parts; cyanide of potassium, 18 parts. The ingredients are to be dissolved in separate portions of warm water. The copper and zinc solutions are to be mixed and the cyanide solution then added, when 250 parts of distilled water are to be added and the mixture well stirred. The bath is to be used at the boiling temperature with two Bunsen cells. By this process, it is said that very rapid deposits of brass have been obtained upon articles of copper, zinc, Britannia metal, etc.

4. French Method of Bronzing Electro-brassed Zinc Work; Steel Bronze.—This is obtained by moistening the articles with a dilute solution of chloride of platinum and slightly heating them. Since this bronze is liable to scale off with friction, it should not be applied in successive doses, but the solution used should be of such a strength that the desired effect may be obtained if possible by a single application. Copper bronze, that is electro-brass with an excess of copper, may be darkened by dipping it into a warm and weak solution of chloride of antimony (butter of antimony) in hydrochloric acid. Sometimes the color will be violet instead of black.

5. French Method of Bronzing Electro-brassed Zinc Work; Green or Antique Bronze.—Dissolve in 100 parts of acetic acid or in 200 parts of good vinegar, 30 parts of carbonate of ammonia or sal-ammoniac, and 10 parts each of common salt, cream of tartar and acetate of copper and add a little water. Mix well and smear the object with it, and allow it to dry at the ordinary temperature, from twenty-four to forty-eight hours. At the end of that time the article will be found to be entirely covered with verdigris, which presents various tints. It is then to be brushed, but more especially the

prominent parts, with a waxed brush, that is a brush passed over a lump of yellow beeswax. The relief parts may then be "set off" with hematite, chrome yellow, or other suitable colors. Light touches with ammonia impart a blue shade to the green parts; carbonate of ammonia deepens the color.

Cadmium has been electro deposited from a solution of the double cyanide of cadmium and potassium.

Cobalt, to Electroplate Metals with.—1. The formulæ for nickel plating may be used for cobalt, by substituting cobalt salts for nickel, where these are mentioned.

2. Cobalt may be electro deposited from an alkaline solution of the double sulphate of cobalt and ammonia.

Copper, Alkaline Copper Solution.—1. The best alkaline copper solution is that introduced by Mr. A. Watt, and subsequently modified by Mr. J. T. Sprague. Dissolve 8 oz. of copper sulphate in 1 qt. hot rain water and set aside to cool. When cool, add liquid ammonia, while stirring with a stick or glass rod. At first a green precipitate will fall, and then this will dissolve on adding more ammonia, until the whole solution assumes a lovely blue tint. Dilute this with an equal bulk of cold rain water, and add to it enough solution of potassium cyanide, while stirring, to destroy the fine blue color of the ammonia sulphate and give the color of old ale to the solution. Set this aside for a few hours, then pass it through a calico filter and make it up to a gallon of solution with rain water. This solution may be worked cold, but the rate of deposition is increased and the deposited copper of improved quality when the solution is heated to a temperature of from 110° to 130° F.

2. Electro-coppering Flowers, Insects, etc.,—To render non-metallic substances conductive (Parkes).

a. A mixture is made from the following ingredients: Wax or tallow, 1 oz.; India rubber, 1 drm.; asphalt, 1 oz.; spirit of turpentine, 1½ fl. oz. The India rubber and asphalt are to be dissolved in the turpentine, the wax is then to be melted, and the former added to it and incorporated by stirring. To this is added 1 oz. of a solution of phosphorous in bisulphide of carbon in the proportion of 1 part of the former to 15 parts of the latter. The articles being attached to a wire are dipped in this mixture; they are next dipped in a weak solution of nitrate of silver, and when the black appearance of the silver is fully developed the article is washed in water; it is afterward dipped in a weak solution of chloride of gold and again washed. Being now coated with a film of gold, it is ready for immersion in the copper bath.

b. Wax and deer's fat, of each ¼ lb. Melt together and add phosphorous 10 grs., dissolved in bisulphide of carbon, 150 grs. The wax mixture must be allowed to become nearly cool, when the phosphorous solution is to be added very carefully through a tube dipping under the surface of the mixture. Stir thoroughly. Moulds prepared from this composition are rendered conductive by being first dipped in a solution of nitrate of silver, then rinsed, and afterward dipped in a weak solution of chloride of gold, and again washed, when they are ready for the coppering solution.

3. To Color Copper and Nickel Plated Objects.—The *Journal des Applications Electriques* says that eleven different colors may be communicated to well cleaned copper and eight to nickel plated objects, by means of the following bath:

Acetate of lead	300 grn.
Hyposulphite of soda	600 grn.
Water	1 qt.

After the salts are dissolved, the solution is heated to ebullition, and the metal is afterward immersed therein. At first a gray color is obtained, and this, on the immersions being continued, passes to violet, and successively to maroon, red, etc., and finally to blue, which is the last color.

As the substances that enter into the composition of the solution cost but a few cents, the process is a cheap one. It is especially applicable in the manufacture of buttons.

4. Water 1000 parts.
Acetate of copper (crystallized) 20 parts.
Carbonate of soda 20 parts.
Bisulphite of soda 20 parts.
Cyanide of potassium (pure) 20 parts.

First mix the acetate of copper with just enough water to make a paste, then add the carbonate of soda and 200 parts water; after stirring add the bisulphite of soda and 200 parts water, and finally the rest of the water and the cyanide of potassium. If the liquid appears blue, add enough cyanide to decolorize it.

5. Copper Deposits.—Where it is intended to simply coat or plate another metal or alloy, the electro deposit of copper is usually obtained by the decomposition of a double salt, such as the cyanide of copper and potassium. This process is adapted to most metals, and affords a fine uniform deposit. The following is a good bath of this description:

Water (soft)	1 gal.
Acetate of copper (cryst.)	3½ oz.
Carbonate of soda (cryst.)	3½ oz.
Bisulphite of soda	3 oz.
Cyanide of potassium (pure)	7½ oz.

Moisten the copper salt with water to form a paste (otherwise it is apt to float on the liquid; stir in next the carbonate of soda with a little more water, then the bisulphite, and finally the cyanide with the rest of the water. When solution is complete the liquid should be colorless. If not, add cyanide until it is.

The bath may be employed hot or cold, and requires a moderately strong circuit of electricity. A copper plate forms the anode, and it should expose surface enough to supply the loss of copper—at least a surface equal to that of the work. It must be removed when the bath is not in use.

If the liquid becomes colored, more cyanide must be added.

Large pieces are generally kept hanging motionless in the bath while the plating is in progress; small articles are moved about as much as possible, especially if the bath is warm.

The formula for the bath given above requires pure cyanide of potassium, and where the commercial article, which is often very impure, is used instead, considerable allowance must be made. The following formulæ require a cyanide containing 70 to 75% (a good average) of pure potassium cyanide.

6. Cold Bath for Iron and Steel.—

Acetate of copper	3 oz.
Carbonate of soda	6½ oz.
Bisulphite of soda	3½ oz.
Cyanide of potassium	3½ oz.
Water	1 gal.
Aqua ammonia	2½ fl. oz.

Prepare as before.

7. Warm Bath.

Acetate of copper	3½ oz.
Carbonate of soda	3½ "
Bisulphite of soda	1½ "
Cyanide of potassium	4½ "
Water	1 gal.
Aqua ammonia	1½ fl. oz.

8. Hot or Cold Bath for Tin, Cast Iron, or Large Zinc Pieces.

Acetate of copper	12½ oz.
Bisulphite of soda	10 "
Cyanide of potassium	18 "
Water	5½ gal.
Ammonia (aqua)	7 fl. oz.

9. For small articles of zinc, which are coppered in a perforated ladle and in nearly boiling baths:

Acetate of copper	16 oz.
Bisulphite of soda	3½ "
Cyanide of potassium	25 "
Aqua ammonia	5½ "
Water	4 to 5½ gal.

In the preparation of these baths the salts are all dissolved together, except the copper acetate and ammonia, which are added after dissolving together in a small quantity of the water.

The deep blue color of the ammonio-copper solution should entirely disappear on mixing it with the other solution; otherwise it becomes necessary to add more cyanide.

The cold bath is put into well joined tanks of oak or fir wood, coated inside with gutta percha or asphaltum (genuine). The vertical sides are also covered with sheets of copper, all connected with the last carbon or copper of the battery by a stout copper wire with well cleaned ends, the other pole of the battery being in similar connection with a stout brass rod extending the length of the tank (without any point of contact with the anodes), and from which the work is suspended by hooks or trusses in the bath.

With a thin deposit the coating is sufficiently bright to be considered finished after being rinsed and dried. But if the operation is more protracted the deposit has a dead luster on account of its thickness, and if a bright luster is desired it is necessary to use the scratch brush.

The hot baths are usually put into stoneware vessels heated by a water or steam bath, or into an enameled cast iron kettle placed directly over a fire. The vessels are lined inside with copper, the edges of the vessels being varnished, or support a wooden ring upon which rests a brass circle connected with the zinc pole of the battery. The objects to be electroplated are suspended from this ring.

The hot process is more rapid than the cold, and is especially adapted to those articles which are difficult to cleanse. The articles are kept in continual agitation, which permits of the employment of a strong current of electricity. Small articles of zinc are placed in a perforated stoneware or enameled ladle, at the bottom of which is attached a copper wire which is wound up around the handle and connected with the zinc pole of the battery. It is sufficient that one of the small articles touches the wire for all to be affected by the current, as they are in contact with each other. The ladle must be continually agitated, so as to change the points of contact of the objects. What has been said in regard to strength of battery, in the article on electro brass plating, will apply here.

10. Copper Deposits by Dipping.

This is seldom practiced except upon iron, as deposits thus obtained are generally wanting in lasting qualities, since, from the thinness of the coating, the iron is but imperfectly protected from atmospheric influences. If the iron is dipped in a solution of—

Sulphate of copper	3½ oz.
Sulphuric acid	3½ "
Water	1 to 2 gal.

it becomes covered with a coating of pure copper, having a certain adhesion; but should it remain there a few minutes, the deposit becomes thick and muddy, and does not stand any rubbing. Small articles, such as pins, hooks and nails, are thus coppered by tumbling them for a few moments in sand, bran, or sawdust impregnated with the above solution, diluted with three or four volumes of water.

Gold Deposits.—In the practice of electroplating with gold the bath employed is usually heated, as the deposits obtained in such a bath are more homogeneous, tenacious and durable, and of a better color, besides which recommendation a greater quantity of the metal may be deposited satisfactorily from it in a given time than from a cold bath.

Owing to the cost of the metal to be deposited very large surfaces are rarely required to be electroplated, and as these baths become worn out and must be replaced by fresh solutions after a short time, they are usually, as a matter of economy and convenience, used in as small a vessel as the circumstances will admit of. These vessels may be of glass, porcelain, or porcelain-enameled iron. The latter serve the purpose admirably (if the enamel is good). They should be heated over the water bath or by means of steam.

The same bath does not answer very well for all metals—either the bath must be modified to suit the metal or the latter must be previously coated with another metal to suit the conditions. Gold deposits are obtained with the greatest facility upon silver or copper, their rich alloys, or other metals coated with them. With these a hot bath (at about 170° F.) and a moderately strong current give good results. With alloys, such as German silver, the best results are obtained with a weak bath, barely warm. Steel and iron, when not coated with copper, require an intense current and a very hot bath. Lead, zinc, tin, antimony and bismuth alloys of, or containing much of these, are preferably coated with copper before electrogilding.

1. Hot Baths.

For silver, copper, or alloys rich in these.

Distilled water	1 gal.
Phosphate of soda, cryst.	9½ oz.
Bisulphite of soda	1⅝ oz.
Cyanide of potassium, pure	¼ oz.
Gold chloride	160 grn.

Dissolve in a portion of the water, heated, the phosphate of soda. Dissolve in another portion of the water the bisulphite of soda and cyanide of potassium.

Dissolve the gold chloride in the remaining water, stir the solution slowly into the cold phosphate of soda solution, and finally add the solution of cyanide and bisulphite. The bath, now ready for use, should be colorless.

The cost of this bath is about $5 a gal. and the metal can be deposited from it profitably at $2 per dwt. Used at a temperature of from 120° to 175° F.

2. Bath for Iron and Steel—Uncoated.

Distilled water	1 gal.
Phosphate of soda, cryst.	7⅝ oz.
Bisulphite of soda	2 oz.
Cyanide of potassium, pure	⅜ drm.
Gold chloride	160 grn.

Dissolve as before. *Heat to 175° or 180° F.* Pass the second metal through the hot potash, then through dilute muriatic acid (acid 1, water 15), brush, and connect at once. Requires a very intense current at first.

3. The following baths work well with bronze and brass, but are not suited for direct gilding on iron or steel:

Distilled water	1 gal.
Phosphate of soda, cryst.	6⅜ oz.
Bisulphite of soda	1⅜ oz.
Bicarbonate of potash	¼ oz.
Caustic soda	⅛ oz.
Cyanide of potassium, pure	¼ oz.
Gold chloride	⅛ oz.

Dissolve all together, except the gold chloride, in the hot water; filter, cool and gradually stir in the gold chloride dissolved in a little water. Heat from 120° to 140° F. for use. It requires an intense current.

4. Distilled water	1 gal.
Ferrocyanide of potassium	5½ oz.
Carbonate of potash, pure	1⅜ oz.
Sal ammoniac	⅜ oz.
Gold chloride	⅛ oz.

Dissolve as in the last, boil for half an hour, replace the evaporated water, and the bath is ready for use.

5. Distilled water .. .. 1 gal.
Cyanide of potassium..... .....2½ oz.
Gold chloride..... ...1 oz.

Dissolve the gold chloride in the water, then add the cyanide, and stir until solution is complete.

Baths of this kinds are commonly used, and with little regard to temperature. They are simple in preparation, but are, unfortunately, not very uniform in their working, ungilding one part while another is gilding, and producing a variety of colors, especially when freshly prepared. They improve by use. however.

6. Cold Electro-Gilding Bath.

Water, distilled..... .....1 gal.
Potassium cyanide, pure.... ....3½ oz.
Gold chloride.....3 1/10 oz.

Dissolve the cyanide in a part of the water, then gradually add the gold chloride dissolved in the remainder. Boil for half an hour before using. (Use cold.)

The cold bath is kept in a gutta percha lined, wooden, or (if small) porcelain tank arranged as for brass plating. The anodes are thin plates of laminated gold, wholly suspended in the liquid (while in use) by means of platinum wires, from clean brass rods joined to the copper or carbon pole of the battery, the rods supporting the work being in connection with the zinc. When in proper working order the color of the deposit is yellow. If the deposit becomes black or dark red, add more cyanide (dissolved in water) to the bath, or use a weaker current.

If the cyanide is in excess the plating will proceed very slowly or not all; or, as sometimes happens, articles already gilded will lose their gold. In such a case add a little more gold chloride or increase the intensity of the current.

Cold electro-gilding must be done slowly, and requires a great deal of attention to secure good work. The articles must be frequently examined to detect irregular deposits or dark spots (which must be scratch-brushed and returned). It is also frequently necessary to add to or remove an element from the battery, especially when adding or taking work from the bath. With too much intensity of current the deposit is black or red; if too weak those portions opposite the *anode only* get covered. In coating German silver it is necessary to use a weak bath and a small exposure of anode. The best results with this alloy are obtained when the bath is slightly warmed.

7. Management of the Hot Bath.

The articles should be kept in agitation while in the bath. They should be placed in connection with the battery before or immediately upon entering the bath. A foil or wire of platinum is in many cases preferable to a soluble gold anode when electro-gilding by aid of heat. It suffers no alteration in the liquid, and by its manipulation the color of the deposit may be materially altered. When it is removed so as to expose only a small surface in the bath a pale yellowish deposit may be obtained; when the immersion is greater, a clear yellow; with a still greater exposure, a red gold color. The strength of th hot baths may be maintained by successive additions of gold chloride with a proper proportion of the other salts and water; but it is preferable to wear out the bath entirely and prepare a new one, as it soon becomes contaminated with copper or silver if much of these metals have been gilt in it. In a nearly exhausted bath containing dissolved copper the electro deposit will be what is called "red gold;" if it contains an excess of silver a "green gold" deposit will result. The gold and copper or gold and silver are deposited together as an alloy, the color of which depends upon the relative proportion of the metals, battery, strength, etc.

Dead luster gilding is produced by the slow deposition of a considerable quantity of gold, by giving the metallic surface a dead luster before gilding (by means of acids), by first preparing a coating of frosted silver or by depositing the gold upon a heavy copper deposit produced with a weak current in a bath of copper sulphate.

In order to secure a good deposit of gold it is absolutely necessary that the work should be perfectly freed from any trace of oxide, grease, oil, or other impurity. Articles of copper and brass may be cleansed by first immersing them in a strong boiling solution of caustic potash or soda, and, after rinsing, dipping momentarily in nitric acid and immediately rinsing, or scouring with pumice stone moistened with a strong solution of cyanide of potassium in water.

Other metals require a somewhat different treatment, which we will have occasion to refer to in a subsequent article.

The bichromate battery is commonly used in connection with hot electro-gilding baths,

As gold chloride procured in the market cannot always be depended on for purity and strength, it is preferable to purchase the gold and make the chloride. A pure gold chloride may be prepared as follows:

Put coin gold, in small pieces, into a glass flask with about five times its weight of aqua regia (nitric acid 1, hydrochloric acid 3), and heat gently, with small additions of aqua regia if necessary, until the gold is dissolved and the silver remains behind as white chloride. Let it settle, decant the clear solution, wash the residue several times with water, adding the washings to the gold solution. Evaporate off excess of the acids in a porcelain dish over a water bath (nearly to dryness). Dilute with ten parts of water, and gradually add a strong aqueous solution (filtered) of sulphate of iron. Let stand until the dark powder (gold) settles; gently decant the liquid, wash the gold with hot water, and redissolve it in a small quantity of warm aqua regia and evaporate the solution with constant stirring, to dryness in a porcelain dish over the water bath. One ounce of pure gold equals about 1 1/10 ounces of gold chloride.

8. Amateurs' Gilding Solution.—The best and cheapest solution for amateur electro-gilding, and also for operators in a small way of business, is the double cyanide of gold and potassium solution made by the battery process. This contains some oxide of potash, but if made up of pure gold and pure 98% cyanide of potassium, it will yield good results at once, and continue to give them for years if kept in proper working condition. This solution is made up in the following manner: Procure 5 dwts. pure gold ribbon, leaf, or wire (and divide it into 2 parts), 3 dwts. pure white 98% cyanide of potassium and 1 qt. of distilled water. Dissolve the cyanide of potassium in the distilled water made hot in a good enameled saucepan, and keep it at nearly scalding heat while making and working the gilding solution. Make up a battery of two Bunsen cells or three Daniel cells in series. Hang one strip of gold from the wire leading to the negative element of the battery, and the other strip to the wire leading to the positive element of battery. Get a small, clean, white porous battery cell, nearly fill it with cyanide of potassium solution, place it in the saucepan and suspend in the porous cell the strip of gold connected to the zinc element of the battery. Immerse the other strip of gold in the outer cyanide solution, and pass current (from the battery) from one to the other for some two or three hours. During that time some of the gold will have dissolved off the anode strip and entered into combination with the cyanide of potassium

solution to form the double cyanide of gold and potassium gilding bath, but this will not have penetrated into the porous cell, nor will the strip of gold therein have suffered any loss. If at the end of this time a piece of German silver, suspended from the cathode wire in the outer solution, receives a fair coat of gold in a few moments, the bath is ready for gilding work. The contents of the porous cell may be poured into the outer solution, both strips of gold used as the anode, and the work may proceed with current from one or more cells, as may be required. At first there may be too much free cyanide, and the deposit may in consequence be too dark, but this fault will soon be corrected if the anode plates are wholly immersed while gilding. If the contrary condition exists, and the anode plates are dirty, or do not dissolve freely, add a very little more cyanide to the solution. This will be found to be the cheapest solution, because there is no loss of material in making it up. If the whole of the gold strip dissolves in the cyanide solution, the bath will not be too rich in gold, as a very useful strength is 2 dwts. of gold in the quart of solution. A larger quantity may be made in the same manner in the same proportions.

9. French Gilding for Cheap Jewelry.—The bath for gilding recommended by Roseleur is composed of pyrophosphate of soda or potassa, 800 grm.; hydrocyanic acid of ⅛ (prussic acid), 8 grm.; chloride of gold crystallized, 20 grm.; distilled water, 10 liters. The pyrophosphate of soda is generally employed and this may be prepared by melting at a white heat, ordinary crystallized phosphate of soda in a crucible. The quantity of gold given in the above formula represents the grammes of the pure metal dissolved by aqua regia. In making the bath 9 liters of water are put into a porcelain vessel and the pyrophosphate added, with stirring a little at a time, moderate heat being applied until all the salt is dissolved. The solution is then filtered and allowed to cool. The chloride of gold is allowed to crystallize, the crystals dissolved in a little distilled water, and the solution filtered. Add the chloride solution to the cold solution of pyrophosphate of soda, then add the hydrocyanic acid and heat to near boiling point.

This bath will produce fine gilding upon well cleaned articles, which must also have been passed through a very diluted solution of nitrate of mercury, without which the deposit of gold is red and irregular. The articles must be constantly agitated in the bath, and supported by a hook, or placed in a stoneware ladle perforated with holes.

10. Gilding Solution (Fizeau's).—*A*. 1 part of dry chloride of gold is dissolved in 160 parts distilled water; to this is added gradually a solution of a carbonated alkali, in distilled water, until the liquid becomes cloudy. This solution may be used immediately.

B. 1 grm. chloride of gold; 4 grm. hyposulphite soda, distilled in 1 liter of distilled water.

11. Wood's Solution.—4 oz. (troy) cyanide of potassium; 1 oz. cyanide gold, dissolved in 1 gal. distilled water. The solution is used at a temperature of about 90° Fah., with a current of at least two cells.

12. M. De Briant's Solution.—Dissolve 34 grm. of gold in aqua regia, and evaporate the solution until it becomes neutral chloride of gold; then dissolve the chloride in 4 kilogrammes of warm water and add to it 200 grm. of magnesia; the gold is precipitated. Filter and wash with pure water; digest the precipitate in 40 parts of water, mixed with 3 parts of nitric acid, to remove magnesia, then wash the remaining (resulting) oxide of gold with water, until the wash water exhibits no acid reaction with test paper (litmus paper). Next dissolve 400 grm. ferrocyanide of potassium (yellow prussiate of potash) and 100 grm. of caustic potash in 4 liters of water, add the oxide of gold, and boil the solution about twenty minutes. When the gold is dissolved, there remains a small amount of iron, precipitated, which may be removed by filtration, and the liquid of a fine gold color is ready for use; it may be employed either hot or cold.

13. Gilding Solution.—The following solution, to be used at a temperature of from 120° to 180° Fah., is recommended by M. E. Rod in *Le Monde de La Science* crystallized phosphate of soda, 60; bisulphate of soda, 10; cyanide of potassium, 1; chloride of gold, 2½; distilled or rain water, 1,000 parts by weight. To prepare this bath properly the water should be divided into three portions, viz., one of 700 parts and two of 150 parts. The sodic phosphate is dissolved in the first portion, the chloride of gold in the second, and the bisulphate of soda and cyanide of potassium in the third. The first two portions are gradually mixed together, and the third is afterward added. With this solution M. Rod uses a platinum anode (a wire or strip), adding fresh portions of the gold salt as the solution becomes exhausted.

14. Electro-Gilding Solution. Cold.—The cold gilding bath is sometimes used for very large objects, as clocks, chandeliers, etc., to avoid the necessity of heating large volumes of liquid—Ferrocyanide of potassium (yellow prussiate of potash) 20 parts, pure carbonate of potash 30 parts, sal-ammoniac 3 parts, gold 15 parts, water 1,000 parts. All of the salts except the chloride of gold are to be added to the water, and the mixture boiled and afterward filtered. The chloride of gold is next to be dissolved, in a little distilled water and added to the filtered liquor. The deposit of gold from cold solutions varies greatly as to color. When the bath is in its best working condition, and a brisk current of electricity employed, the gold should be of a pure yellow color.

15. Gilding Polished Steel.—For gilding polished steel, a nearly neutral solution of chloride of gold is mixed with sulphuric ether and well shaken. The ether will take up the gold and the ethereal solution float above the denser acid. If the ethereal solution be applied by means of a camel's hair brush to brightly polished steel or iron, the ether evaporates and the gold, which adheres more or less firmly, becomes reduced to the metallic state on the steel, and may be either polished or burnished. Steel receives a deposit of gold with great rapidity, even with a very weak battery current.

16. For Producing a Dead or Matted Surface on Brass Articles of Jewelry, as Brooches, Lockets, etc.—First dip them for an instant in a mixture composed of equal parts of sulphuric and nitric acids, to which a small quantity of common salt is added; plunge immediately in cold water. Rinse in one or two other waters, then immerse in the gilding bath, in which, after a moment's immersion, they acquire the desired color of gold. After rinsing in hot water they are finally dried in hot boxwood sawdust.

17. Gilding Lead, Britannia Metal, etc.—When articles composed of lead, tin, Britannia metal, iron or steel are required to be gilded it is best to give them a preliminary coating of copper in an alkaline bath, or to electro-brass them, after which they may be easily gilded. The softer metals need to be burnished with great care, owing to their yielding nature under the pressure of the burnishing tools.

Operations connected with Electro-deposition.—Solution for protecting plated work, which is to be gilded in a hot cyanide bath, from receiving the gold deposit upon parts of the ornamental work: Clear resin, 10 parts; yellow beeswax, 6 parts; best red sealing wax, 4 parts; jeweler's rouge, 3 parts. The three first named substances are to be thoroughly melted, with gentle stirring, and the rouge, which is the peroxide of iron, gradually added

and incorporated with stirring. The article to which the stopping off varnish has been applied should never be placed either in a hot or cold bath until it has become thoroughly dry and hard.

Iron.—Electro-deposition of Iron, Solutions for.—1. Ammonio Sulphate of Iron Solution.—This double salt, which was first proposed by Boettger, for depositing this metal, may be readily prepared by evaporating and crystallizing mixed solutions of equal parts of sulphate of iron and sulphate of ammonia. A solution of the double salt yields a fine white deposit of iron, with a moderate current, and has been very extensively enployed in "facing" engraved copper plates. When carefully worked this is one of the best solutions for the deposition of iron upon copper surfaces.

2. Boettger's Ferrocyanide Solution.—This solution for coating engraved copper plates with iron is formed by dissolving 10 grm. of ferrocyanide of potassium (yellow prussiate of potash) and 20 grm. of Rochelle salts in 200 cubic centimeters of distilled water. To this solution is added a solution consisting of 3 grm. of persulphate of iron in 50 cubic centimeters of water. A solution of caustic soda is then added drop by drop, with constant stirring, until a perfectly clear, light, yellowish liquid is obtained, which is ready for immediate use.

Lead may be deposited from its acetate solution or from a solution of oxide of lead, in caustic soda or potash, in the form of beautiful metallo-chromes, on polished surfaces of steel or nickel.

Magnesium has been deposited from a solution of the double chloride of magnesium and ammonia.

Metallo-chromes. See **Appendix.**

Nickel.—Preparation of Nickel Solution.—The substance generally employed is the double sulphate of nickel and ammonia, or "nickel salts," a crystalline salt of a beautiful green emerald color. This article should be pure. For 100 gal. of the solution the proportions employed are: Double sulphate of nickel and ammonia, 75 lb; water, 100 gal. Place the nickel salts in a clean wooden tub or bucket and pour upon them a quantity of hot or boiling water; stir briskly with a wooden stick for a few minutes, after which the green solution may be poured into the tank, and a fresh supply of hot water added to the undissolved crystals, with stirring as before. This operation is to be continued until all the crystals are dissolved, and the solution transferred to the tank. A sufficient quantity of cold water is now to be added to make up 100 gal. in all. It is better to pass the hot solution through a strainer before it enters the tank, to free it from impurities.

Nickel Plating—The Plating Bath.

The nickel salts commonly used are the nickel ammonium sulphate (called double sulphate) and the corresponding chloride. Other salts, such as the nickel potassium cyanide, the acetate and sulphate, have been used, but not so successfully as these.

The double sulphate bath may be prepared by dissolving ¾ lb. of the salt in each gallon of water (soft). The salt costs about 65 cents a pound, and is generally considered the best for this purpose. It should be kept neutral and up to about 6° of hydrometer.

The double chloride bath requires about 4 oz. of the salt per gallon, and works better slightly acid, the tendency in working being toward alkalinity.

The bath should be filtered when freshly prepared, and should be kept in a separate room, or at least away from the apartment in which the buffing or polishing is performed, to avoid contamination by dust as much as possible. Exposed to the air, the bath (the water) evaporates, and the water thus lost must be replaced from time to time. To retard this and keep out dust as much as possible, it is well to cover the bath when not in use. Its surface should be skimmed occasionally and it should be frequently mixed together to preserve a uniform degree of strength.

The tank or vessel in which the bath is contained is usually constructed of smooth 2 in. white pine stuff, grooved and well bolted together and coated on the inside with good asphaltum applied in the melted state.

Instead of this form, a clean tub or a half barrel or hogshead, with an extra hoop, may be used, though from the shape of such a vessel there is necessarily much waste space to be filled with useless liquid.

For small baths a neat form of vessel consisting in a square porcelain lined (enameled) iron tank of suitable dimensions is sold by some of the dealers in electroplating materials.

Anodes or Feeding Plates.

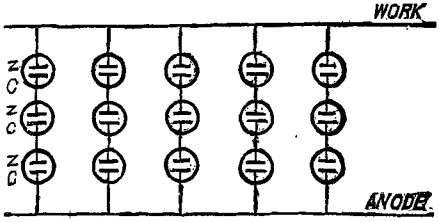
Good pure cast nickel anodes are now obtained at a moderate cost ($1.85 per lb.), and are preferable to grain metal anodes. They usually come in sizes ranging from 1¾ x 4 in., ⅛ in. thick, to 8 x 12 in., ⅝ in. thick.

They may be suspended around the sides of the tank or across and facing the work (care being taken to avoid bringing them into such close proximity to the work that contact is likely to occur under any circumstance). They may be suspended by clean copper brusses or hooks—which should not be permitted to touch the liquid—from stout copper rods, to which connection with the battery is made.

The Battery.

In nearly all large electroplating establishments some form of dynamo-electric machine is now used instead of the battery. They are cleanly, require little attention and space and afford a current more easily adapted to the work and at a much smaller cost.

But as their first cost is considerable, and they require power to operate them, the old battery is still in requisition in smaller establishments. The carbon or chromic acid battery is more commonly used, as it admits of more rapid work with a smaller number of cells; but as it supplies a very intense current, it often becomes necessary to introduce resistance coils to reduce it where small work is on hand. Some of the best work we have ever seen has been produced with the current derived from two or three Smee or sulphate of copper cells (in series). The amount of battery power for a given amount of work should be in zinc surface (exposed) about equal (when in proper working order) to the surface of the work exposed in the plating bath, with care to preserve the tension. If one cell has a zinc surface (exposed) of, say one hundred square inches, and the work, say, five hundred, the one cell will require to be multiplied by five for quantity and (if the original tension was, say, three) by three to preserve the tension. Thus:



Of course this is equivalent to three large single cells, each exposing five hundred square inches of zinc (equal to a plate about sixteen inches square, exposing both sides). Large batteries of the dipping form, admitting of the immersion of the proper quantity of zinc, are often convenient.

If the current is too strong the deposited metal will present a dull (commonly termed burnt) appearance; if too weak it is apt to be imperfect, granular, or semi-crystalline.

For practical purposes the electricity may be said to proceed from the copper or carbon pole of the battery, and care should be taken that this pole is invariably connected (by stout copper wires or rods) with the anodes or feeding plates in the plating bath, for if misconnected damage is done both to the work and the bath by the corrosion or partial solution of the former in the latter.

Preparing the Work.

Before work can be plated its surface must be freed perfectly from all traces of oil or grease, oxides, lacquer, and other impurities. Oil, grease, etc., are removed by contact with a strong, hot aqueous solution of caustic potash, and, after rinsing off the adhering alkali, from oxide by an acid bath; or, if of brass, copper, or German silver, by scouring with fine pumice stone and strong aqueous solution of cyanide of potassium. Iron is pickled in dilute sulphuric or muriatic acid (acid 1, water 5 to 15), and scoured with fine white silicious sand or pumice stone. Brass or copper is sometimes brightened before entering to the plating bath by dipping it momentarily in nitric acid diluted with about 20 parts of water, and quickly rinsing it in running water. It should be placed in circuit immediately after this.

The hand must not come into contact with any part of the work after removal from the alkali, as the slightest touch may spoil all.

On removal of the plated work from the plating bath it should be quickly rinsed (without handling) in cold water, then transferred to hot water, which will cause it when taken out to dry quickly and perfectly. If the finished work is to present a smooth polishing surface it must present such a surface before entering the plating bath. Nickel is hard and will not readily submit to a burnishing tool.

When the work is placed in circuit in the plating bath (and it should not be permitted to remain many moments in the bath without being placed in circuit) it should be moved about to free it from bubbles.

The process of nickel plating is a simple one, and by a little practice and proper attention to the requirements the bath may be worked month after month, and the metal deposited smoothly and with certainty.

Formulæ for Nickel-Plating Solutions.

1. Double sulphate of nickel and ammonium..... 5 to 8 parts.
   Water..... 100 parts.

Dissolve the nickel double salt in above quantity of water with the aid of heat. Cautiously add ammonia, or the sulphate of ammonium, until the solution is neutral to test paper. This solution should be maintained as nearly neutral as possible in use. This is commonly known in the United States as the Adams solution. It is in very general use by nickel platers throughout the United States, and yields, where properly managed, excellent results.

2. Double sulphate of nickel and ammonium..... 10 parts.
   Boric acid (refined)... 2½ to 5 parts.
   Water..... 150 to 200 parts.

(Weston's solution.) The superiority of this solution is generally acknowledged. The deposited metal, as previously remarked, is almost silver-white, dense, homogeneous and tenacious, and the solution maintains its excellent working quality very uniformly in long-continued service.

The nickel salt and boric acid may be dissolved separately in boiling water, the solutions mixed, and the volume brought up to that of the formula, or the two components may be dissolved together.

3. Acetate of nickel..... 2¾ parts.
   Acetate of calcium..... 2½ parts.
   Water..... 100 parts.

To each gallon of this solution add 1 fl. oz. acetic acid, 1·047 sp. gr.

To prepare this bath, dissolve about the same quantity of the dry carbonate of nickel as that called for in the formula (or three-quarters of that quantity of the hydrated oxide) in acetic acid, adding the acid cautiously, and heating until effervescence has ceased and solution is complete. The acetate of calcium may be made by dissolving the same weight of carbonate of calcium (marble dust) as that called for in the formula (or one-half that quantity of caustic lime), and treating it in the same manner. Add the two solutions together, dilute the volume to the required amount by the addition of water, and then to each gallon of the solution add a fluid ounce of free acetic acid, as prescribed. (Potts' solution.)

4. Sulphate of nickel and ammonium..... 10 parts.
   Sulphate of ammonium..... 4 parts.
   Citric acid..... 1 part.
   Water..... 200 parts.

The solution is made with the aid of heat, and, when cool, small fragments of carbonate of ammonium should be added until the bath is neutral to test paper.

5. Sulphate of nickel..... 6 parts.
   Citrate of nickel..... 3 parts.
   Phosphate of nickel..... 3 parts.
   Benzoic acid..... 1½ parts.
   Water..... 200 parts.

6. Phosphate of nickel..... 10 parts.
   Citrate of nickel..... 6 parts.
   Pyrophosphate of sodium 10½ parts.
   Bisulphite of sodium..... 1½ parts.
   Citric acid..... 3 parts.
   Aqua ammonia..... 15 parts.
   Water..... 400 parts.

(Powell's solutions.) These solutions yield good results, but their complex composition must debar them from general use.

7. Sulphate of nickel..... 6 parts.
   Aqua ammonia..... 3 parts.
   Water..... 100 parts.

When the nickel is dissolved, add—

   Aqua ammonia..... 20 parts.

This bath is similar to that recommended by Prof. Boettger; it is said to be well suited for the purposes of amateurs, inasmuch as it gives good results with a platinum anode. It is worked at a temperature of 100° Fah., with a moderate current. It requires renewal from time to time, as it becomes impoverished in nickel, by addition of fresh nickel salt; it must also be kept alkaline by the occasional addition of ammonia.

8. Sulphate of nickel and ammonium..... 10 parts.
   Sulphate of ammonium... 1½ parts.
   Water..... 250 parts.

Dissolve in boiling water, and allow to cool. These proportions are recommended for coating objects of cast and wrought iron and steel.

9. Sulphate of nickel and ammonium..... 10 parts.
   Sulphate of ammonium..... 2 parts.
   Water..... 300 parts.

Dissolve as above. Recommended for coating brass, copper, tin, britannia, lead, zinc, etc.

Nickel Baths.

Nos.	Formulæ.			Preparation.	Operators.
10.	Double sulphate of nickel and ammonium Distilled water	1 10	kilogramme. liters.	Dissolve to saturation, in distilled water, the double sulphate of nickel and ammonium free from alkaline oxide of metals and alkaline earth metals, and filter after cooling.	Isaac Adams. Gaiffe. Elmore.
11.	Double sulphate of nickel and ammonium Carbonate of ammonium Distilled water	0·400 0·300 10	kilogramme. kilogramme. liters.	Dissolve separately the two salts in a portion of the water, in a hot state. Pour slowly the solution of carbonate of ammonium into that containing the nickel, taking care not to go beyond the neutralization (which is recognized when the litmus paper does not sensibly turn red).	Roseleur.
12.	Sulphate, nitrite or chloride of nickel Disulphite of sodium (without smell) Distilled water	1 1 20	part. part. parts.	Same preparation as above, Nos. 16 and 17 formulæ are given by a manufacturer who is reckoned as an authority. For that reason we publish them without alterations, wishing only to observe that the indications of sulphate, nitrate and chloride cannot be absolutely correct since the proportion of nickel is notably different in these three salts.	Pfanhauser.
13.	Sulphate, nitrate or chloride of nickel Pure crystallized sal-ammoniac Distilled water	1 1 20	part. part. parts.		Ditto.
14.	Sulphate of suboxide of nickel Chloride of ammonium Citric acid Distilled water	2 1 0·100 50	kilogrammes. kilogramme. kilogramme. liters.	Heat the whole to boiling point, then test with litmus. If the latter turns very red add some ammonia as pure and as concentrated as possible until neutralization is reached.	Julius Weiss.
15.	Nitrate of suboxide of nickel Solution of caustic ammonia. Acid sulphite of sodium Distilled water	4 4 50 150	parts. parts. parts. parts.	Dissolve the disulphite in water, the nitrate of suboxide of nickel in ammonia, and mix the two solutions.	G. Boden.

16. Sulphate of nickel and ammonium..... 6 parts.
Chloride of ammonium (sal ammoniac).. ..... 3 parts.
Water.....100 parts.

Watt recommends for ordinary purposes the following solution, which he affirms will give in careful hands very good results: "Take say 2 oz. of pure nickel, dissolve in hydrochloric acid, taking care not to have an excess. A gentle heat will assist the operation. When dissolved, dilute the solution with 1 qt. of cold water. Now add ammonia gradually, until the solution is quite neutral to test paper. Next, dissolve 1 oz. of sal ammoniac (chloride of ammonium) in water, and mix this with the former solution. Lastly, evaporate and crystallize slowly." The resulting salt will be the double chloride of nickel and ammonium. It is one of the earliest solutions used for nickel plating by Smee and Gore, and is affirmed by these writers to give good results. Watt has also obtained excellent results with the double chloride. According to Smee, the simple chloride of nickel will yield a deposit having a very brilliant uster.

I can unqualifiedly confirm the statement of Gore that the electro-deposit obtained from a solution of the double cyanide of nickel and potassium is "nearly equal in whiteness to silver." I have obtained deposits with this solution of such extreme whiteness and beauty as to deceive even an expert on casual inspection into the belief that they were silver. The bath, however, rapidly loses its activity and runs down, and is so difficult to manage that it is impracticable for general use. This, at least, is the opinion I have reached after many trials of it. I am informed, nevertheless, that it is successfully used on the large scale in certain nickel plating works in this country, though I have not been able to substantiate the fact.

To prepare this bath make a solution of any salt of nickel, and add cyanide of potassium solution so long as a precipitate continues to be formed, being careful to avoid adding an excess. Then remove the liquid either by decantation or filtration, and after several washings dissolve the precipitate almost to saturation in cyanide of potassium solution. Make a completely saturated solution and add a small quantity of free cyanide of potassium. The brownish-red solution is then ready for use.—*Correspondent Franklin Journal.*

A large number of American manufactories use the following recipes for nickeling:

17. Bath for Brass, Copper, Tin, Britannia Metal, Lead, Zinc and Tinned Sheet Metal.—13 gal. of water, 4 lb. double sulphate of nickel and ammonium, 14 oz. sulphate of ammonium; dissolve by boiling. Let the liquid cool. Test with red or blue litmus paper. Add a little hydrochlorate of ammonia if any acid is present.

18. Ordinary Nickel Baths.—(1.) 4½ gal. of water, 1¼ lb. double sulphate of nickel and ammonium, ¾ lb. hydrochlorate of ammonia; dissolve by boiling. Make the fluid slightly alkaline by adding 1½ lb. of caustic ammonia. The fluid should show 3° to 4° by the hydrometer.

19. 3½ gal. water, 2 lb. double sulphate of nickel and ammonium, 21 oz. hydrochlorate of ammonium, 14 oz. sulphate of ammonium; dissolve by boiling. Let the liquid cool.

20. Solution for Nickeling Small Articles, such as Umbrella Mounts, etc.—Double sulphate of nickel and ammonium 7 kilogrammes; bicarbonate of soda 800 grm.; water 100 liters. The bicarbonate of soda must be added when the nickel solution is warm, in small quantities at a time, otherwise the effervescence which occurs might cause the solution to overflow. The bath is to be worked up to nearly boiling point. If, after working for some time, the deposit becomes of a darkish color, add a small lump of sulphide of sodium, which will remedy it. —*M. Desmur.*

21. Powell's Process.—This inventor claims that benzoic acid added to any of the nickel salts arrests the tendency to an imperfect deposit, prevents the decomposition of the solution and consequent formation of subsalts. The proportion of benzoic acid to be added to the bath is ⅛ of an oz. to a gallon of the solution. Powell gives the following formulæ for nickel baths:

a. Sulphate of nickel and ammonia, 10 parts; sulphate of ammonia, 4 parts; citric acid, 1 part; water, 200 parts. The solution is prepared with the aid of heat, and, when cool, a small quantity of carbonate of ammonia is added, until the solution is neutral to test paper.

b. Sulphate of nickel, 6 parts; citrate of nickel, 3 parts; phosphate of nickel, 3 parts; benzoic acid, 1½ part; water, 250 parts.

22. A new nickel plating solution, said to yield beautiful results, is prepared by mixing the liquid obtained by evaporating a solution of ½ oz. nickel in aqua regia to a pasty mass and dissolving it in 1 lb. aqua ammonia, with that obtained by treating the same quantity of nickel with a solution of 2 oz. cyanide of potassium in 1 lb. of water. More cyanide renders the deposit whiter and more ammonia renders it grayer.

23. Solution for Nickeling Tin, Britannia Metal, etc.—Sulphate of nickel and ammonium, 10 parts; sulphate of ammonium, 2 parts; water, 300 parts. The salts are to be dissolved in boiling water, and when cold the solution is ready for use. For nickeling cast and wrought iron and steel the following bath is recommended: Sulphate of nickel and ammonium, 10 parts; sulphate of ammonium, 1½ part; water, 250 parts.

24. Renickeling Old Work.—When goods which have been nickel-plated require to be renickeled, it is always better to remove the old coating by means of a stripping solution, as nickel will not adhere to a coating of the same metal. A stripping bath may be composed as follows: Oil of vitriol, 16 lb.; nitric acid, 4 lb.; water, 2 qt. Add the oil of vitriol to the water (not the reverse, which is dangerous) gradually, and when the mixture has cooled down, add the nitric acid, and stir the mixture with a glass rod. When cold it is ready for use. Attach the articles to be stripped to a piece of stout brass or copper wire and place in the stripping liquid; they should be examined after a few moments. The operation of stripping should be conducted in the open air or in a fireplace with good draught. The articles should not be allowed to remain in the liquid one moment after the nickel has been dissolved from the surface, but be immediately removed and plunged in cold water.

1. *Palladium* may be deposited from the double cyanide of palladium and potassium, or from the double chloride of palladium and potassium.

2. Palladium, which is a whiter, lighter and more fusible metal than platinum, has of recent years been much used to plate watch movements, says the *Electrician.* According to M. Pilet four milligrammes (about one-seventeenth of a grain) of palladium is sufficient to coat the works of an ordinary sized watch. M. Pilet recommends the following bath: Water, 2 liters; chloride of palladium, 10 grm.; phosphate of ammonia, 100 grm.; phosphate of soda, 500 grm.; benzoic acid, 5 grm. This bath is suitable for all metals except zinc.

Platinizing Silver.—For use in Smee cells. The silver plate to be coated is plunged in a bath of bichloride of platinum and acidulated water. A current is sent through the bath from a platinum anode, the silver serving as cathode. A rough coating of platinum takes place on the silver.

To Platinize Carbon (Walker).—The carbon plate is purified by immersion for several days in sulphuric acid diluted with three or four times its volume of water, then put into a bath of sulphuric acid diluted with ten times its

volume of water, with crystals of chloride of platinum added until it becomes straw colored.

The carbon is connected to the — pole of the battery and a platinum or carbon plate connected to the + pole serves for anode. After twenty minutes the carbon is platinized, as may be proved by using it to decompose water. The hydrogen should freely rise from its surface.

To Platinize Iron.—Steep the iron plate in an acid solution of platinum in aqua regia.

Silver Plating, Simple Instructions for.—For silver plating the bath consists of potassium silver cyanide, prepared by precipitating solution of silver nitrate with potassium cyanide and redissolving the washed precipitate in excess of potassium cyanide solution—potassium cyanide, 12 oz.; water, 1 gal.; silver cyanide, about 1 troy oz. Filter and use in a porcelain or glazed vessel. For the whitening bath dissolve 1 lb. potassium cyanide in 1 gal. of water, add ¼ oz. troy of silver cyanide and filter the solution. The baths are provided with silver feeding plates for anodes proportioned in size to the surface of the work to be plated. These are connected with the positive pole of the battery. The cleaned articles are connected by a copper wire with the zinc pole of the battery, dipped for a minute or two in the whitening bath, and when uniformly coated with a white film of silver, transferred to the plating bath, under similar conditions. 3 or 4 Smee cells with plates 10x4 in. will generally suffice for the plating bath, and 4 or 5 similar cells for the whitening bath; twenty to thirty minutes in the plating bath is usually sufficient to plate the work properly. Articles of copper, brass or German silver to be plated should first be cleaned by boiling them for a few minutes in strong potash water to free them from traces of oil or grease, and, after rinsing, in dilute nitric acid to remove any oxide and again thoroughly rinsed. It must not be touched by the hand after cleaning. Just before putting the work into the bath, dip it momentarily in strong nitric or a mixture of equal parts nitric and sulphuric acids and rinse quickly. After this treatment it is sometimes dipped for a moment in dilute aqueous mercurous nitrate solution and rinsed again. This has the effect of coating the clean metal with a film of mercury, which secures a perfect adhesion of the deposited silver.

Silver Deposits.

For electro-silver plating the double salt of silver and potassium cyanide is almost universally employed. The baths are used either hot or cold. The latter method is generally adopted for articles which require great solidity. The hot process is used for small articles, and is preferable for steel, iron, zinc, lead and tin, which have been previously electro-coppered. The hot baths are generally kept in enameled cast iron kettles, and the articles are either suspended or moved constantly about in them. A somewhat energetic current is needed, especially when the articles are moved about in order to operate rapidly. A gray or black deposit indicates too strong a current, and when the surface becomes covered with bubbles of gas the same thing is indicated. The anodes are plates of silver or heavy silver foil. The wooden tanks for the cold baths are similar to those used in plating with copper and nickel, but should be very thoroughly coated on the inside with gutta percha.

The Bath.

Water (soft)	1 gal.
Cyanide of potassium (pure)	8 oz.
Nitrate of silver	5¼ "

Dissolve the nitrate of silver in a sufficient quantity of pure water (soft), and add to it gradually, with constant stirring, hydrocyanic (prussic) acid until all the silver has been precipitated as cyanide, which may be known by the formation of no cloud in a portion of the clear liquid when a drop of the acid is added to it. Avoid adding an excess of the acid. Throw the precipitate upon a fine cotton cloth filter, and as the liquid runs through wash the precipitate on the cloth several times with pure water. Dissolve the cyanide of potassium in the water, and stir in the cyanide of silver carefully removed from the cloth. If it does not dissolve in the liquid entirely, add more cyanide of potassium until it does, stirring continually. Let the impurities settle, and the bath is ready for use. Many electroplaters use a preliminary or silver "whitening" bath, which is the same composition, but contains less silver, more cyanide, and is worked with a somewhat stronger current.

The cleaned article in some cases is first dipped for a few moments in a solution of nitrate of mercury, 1 oz. in 1 gal. of water, and then in the whitening bath for a few minutes, and after brushing is transferred to the silver bath proper.

The vessels containing the cold bath are sufficiently high to allow about 4 in. of liquid above the immersed objects, whose distance from the bottom and sides should be nearly the same to give a regular deposit of metal at both ends of the object.

The upper ledge of the trough carries two brass rods all around, which do not touch one another, one above the other, so that other metallic rods placed transversely will rest upon the higher or lower series of rods only. The upper rods are connected with the zinc, the lower with the carbon or copper end of the battery, or with the corresponding poles of the dynamo-electric machine. The transverse rods resting upon the lower set support the silver anodes; those resting on the upper set, the work. The work suspended from an upper tranverse is placed so as to face two anodes suspended from two lower transverse rods.

As the lower layers of the bath are apt to become denser (richer) than the upper, it is often necessary to reverse the articles during the operation to obtain a perfectly uniform thickness of deposit. For the same purpose small articles should be kept in motion as much as possible.

The deposit is finer and denser if obtained with a weak battery and long exposure than if a strong current is employed. A sufficient quantity of silver may be deposited in three or four hours, but it will be of much finer quality and more easily burnished if the work is left in the bath for twelve or fifteen hours with a few cells of battery.

When the articles, especially coppered iron, etc., have acquired a coherent film of silver, they are sometimes removed from the bath, and thoroughly scratch-brushed, cleansed in alcohol, or preferably in a hot silvering bath, thence again passed through the mercurial solution and finished in the cold plating bath.

The first scratch-brushing, which is not always necessary, obviates the tendency of certain alloys to assume a crystalline appearance and corrects the imperfections of the cleansing in process.

Should the anodes become black during the passage of the current, the solution contains too little cyanide. In this the deposit is adherent, but too slow; and the bath loses more silver than it can gain from the anodes.

If the anodes remain white during the passage of the current, the bath contains an excess of cyanide, and the deposit does not properly adhere; correct by adding cyanide of silver until it dissolves with difficulty.

When in good working order, the anodes present a gray appearance while the current is passing, becoming white when circuit is broken.

The specific gravity of the bath may vary from 5° to 15° Baume's hydrometer and still furnish good results.

Electro-silvering baths do not generally work so well when freshly prepared. If properly used and cared for, they improve by age. At first the deposit is often granulated bluish or yellowish.

It is customary to mix portions of an old bath with a freshly prepared one. Some platers introduce small quantities of ammonia instead to age the liquid.

Bisulphide of carbon in small quantities imparts a bright luster to plated articles. 1 oz. of the bisulphide is put into a pint bottle filled with a strong solution of the cyanide of potassium and silver, briskly shaken, and a few drops of this liquid poured into the bath occasionally until the work appears sufficiently bright. An excess of bisulphide must, however, be avoided, as it will spoil the bath.

What has been said about the arrangement of battery in articles of nickel and brass plating will also apply here.

Tin. 1. Deposition of Tin by Simple Immersion or Dipping.—For this purpose a saturated solution of cream of tartar is made with boiling water; in this solution small brass or copper articles, such as brass pins for example, are placed between sheets of grain tin and the liquid is boiled until the desired result is obtained—a beautifully white coating of tin upon the brass or copper surfaces. Ordinary brass pins are coated in this way. A little chloride of tin may be added to the bath to facilitate the whitening. The articles are afterward washed in clean water and brightened by being shaken in a leathern bag with bran. See **Tinning.**

2. Distilled water.....200 parts by weight.
Pyrophosphate of soda. 2 " "
Fused chloride of tin...200 " " "

Dissolve the soda salt first, and then gradually introduce the tin salt.

Wastes, Electro Plating Solutions, to Recover from.—Gold solutions, usually cyanides, are boiled in a porcelain dish, sodic stannate added, and the boiling continued until all the gold has combined with the tin, forming a black precipitate. This precipitate is washed with water and dissolved in aqua regia. The solution of auric and stannic chlorides is carefully evaporated, diluted with distilled water, enough sodiopotassic tartrate added and warmed, when all the gold will be precipited as a brownish yellow powder. For silver solutions it is only necessary to boil with sodic stannate.—*Prof. Boettger.*

Zinc, Electro-deposition of.—For the electro-deposition of zinc solutions of the sulphate, ammonia sulphate, chloride and ammonia chloride may be employed, as also alkaline solutions, prepared by dissolving zinc oxide or carbonate in a solution of cyanide of potassium or caustic potassium; the deposit from either of these alkaline solutions is generally of very good quality, and if too strong a current be not employed the deposited metal is usually very tough.

Person & Sires' Solution for Electro-deposition of Zinc.—This consists of a mixture of 1 part of oxide of zinc dissolved in 100 parts of water, in which 10 parts of alum have been previously dissolved at the ordinary temperature. The current from a single battery cell is employed, and the anode surface should be about equal to that of the articles to be coated.

Electrotyping.—Electrotyping comprises a series of mechanical or electrical means for reproducing engravings or typographical compositions.

The reproductions are called electros and electrotypes. In order to produce an electro the original must be moulded and the mould coated with a galvanic deposition; a fusible metal is then run at the back of this deposition so as to strengthen it, and the plate thus obtained is mounted on a piece of wood of a determined thickness.

Moulds.—The first operation naturally consists in taking the impress of the engraving to be duplicated. Gutta percha, or impermeable plaster, or one of the following mixtures may be used for the purpose:

1. Whitewax.....200 grm.
Spermaceti..... 30 "
Stearine.....250 "
Plumbic carbonate..... 30 "

2. Glue..... 400 "
Molasses..... 100 "

This mixture gives some elasticity to the mould.

3. Bismuth.....250 grm.
Lead.....160 "
Tin.....125 "
Antimony ..... 30 "

Mix, and melt in a clean crucible.

4. Bismuth.....280 grm.
Lead.....190 "
Tin.....100 "

In order to obtain a good result from the last two formulæ the metals are first melted and poured in a vessel containing cold water and a small quantity of straw and hay cut in lengths of about 3 in. The whole is thoroughly stirred while the molten metal is being poured. This divides the metal into shots, which are dried and melted again.

5. Gelatine .....500 grm.
Water.....700 "
Wax ..... 15 "

The gelatine is dissolved in water on a gentle fire and some beeswax in small pieces is added. This mixture must be used tepid and not hot.

6. Beeswax..... 9 kilo.
Venetian turpentine..... 1·35 "
Plumbago in an impalpable state..... 0·225 "

Care must be taken to avoid any dust. If during the cold weather any crack occurs a little Venetian turpentine is added. When the temperature is sufficiently high turpentine can be dispensed with altogether.

Electrum. See **Alloys.**

Electuaries.—These are combinations of sirup or honey and vegetable substances. They are of a fair consistency, being neither liquid nor solid. These are made for the purpose of hiding the taste of disagreeable medicines, which are taken in the electuaries.

Elements.—*Table showing the grouping of the elements:*

Oxygen.	Chlorine.	Nitrogen.	Chromium.
Sulphur.	Bromine.	Phosphorus.	Vanadium.
Selenium.	Iodine.	Arsenic.	Molybdenum.
Tellurium.	Fluorine.	Antimony.	Tungsten.
Silicon.	Barium.	Cerium.	Iron.
Titanium.	Strontium.	Lanthanum.	Cobalt.
Tantalum.	Calcium.	Didymium.	Nickel.
Niobium.	Magnesium.		Manganese.
Cadmium.	Potassium.		Platinum.
Zinc.	Sodium.		Palladium.
	Lithium.		Rhodium.
	Cæsium.		Iridium.
	Rubidium.		Ruthenium.
			Osmium.

The wood cut is covered with plumbago and forced into the wax by hydraulic pressure. The mould is covered with very finely powdered plumbago and immersed in a bath composed of a nearly saturated solution of cupric sulphate with 120 grn. sulphuric acid for each 10 l. of liquid. A thin coat of copper is thus deposited upon the mould. The current is usually produced by dynamos. The shell is backed with type metal, and afterward planed and routed.

Elements, Table of the Symbols, Atomicity, Atomic and Equivalent Weights of the.

	Symbol and Atomic Value.	Atomic Weight.	Equivalent Weight.
Aluminum (Al_2^{vi})	Al^{iv}	27·5	9·13
Antimony (Sb''')	Sb^{v}	122	40·66
Arsenicum (As''')	As^{v}	75	25·0
Barium	Ba''	137	68 5
Beryllium or glucinum.	Be''	9·5	4·7
Bismuth (Bi''')	Bi^{v}	208	69·33
Boron	B'''	11	3·66
Bromine	Br'	80	80·0
Cadmium	Cd''	112	56 0
Cæsium	Cs'	133	135·0
Calcium	Ca''	40	20·0
Carbon (C'')	C^{iv}	12	3·0
Cerium (Ce'')	Ce^{vi}	92	46·0
Chlorine	Cl	35·5	35·5
Chromium (Cr_2^{vi})	Cr^{vi}	52·5	26·1
Cobalt (Co'')	Co^{vi}	58 8	29·4
Copper	Cu''	63·5	63·4 / 31·7
Davyum	——	——	——
Decipium	——	——	——
Didymium	D''	96	47·5
Erbium (?)	Eb''	112·6	56·3
Fluorine	F'	19	19·0
Gallium	——	——	——
Gold	Au'''	196·7	65·33
Hydrogen	H'	1	1·0
Indium	In^{vi}	75·6	37·8
Iodine	I'	127	127·0
Iridium	Ir^{iv}	107	49·5
Iron (Fe'' & Fe_2^{vi})	Fe^{vi}	56	28·0 / 18·66
Lanthanium	La'	92	46·4
Lavœsium	——	——	——
Lead (Pb'')	Pb^{iv}	207	103·5
Lithium	L'	7	7·0
Magnesium	Mg''	24	12·0
Manganese (Mn'' & Mn^{iv})	Mn^{vi}	55	27·5
Mercury	Hg''	200	200·0 / 100·0
Molybdenum	Mo^{vi}	96	45·4
Mosandeum	——	——	——
Nephmium	——	——	——
Nickel (Ni'')	Ni^{vi}	58·8	29·4
Niobium	Nb^{v}	97·6	18·8
Nitrogen (N' & N''')	N^{v}	14	4·66
Norwegium	——	——	——
Osmium	Os^{iv}	199	49·75
Oxygen	O''	16	8·0
Palladium	Pd^{iv}	106·5	53·25
Phillipium	——	——	——
Phosphorus (P''')	P^{v}	31	10·33
Platinum	Pt^{iv}	198	98·7 / 49·35
Potassium (Kalium)	K'	39	39·1
Rhodium	Rh^{iv}	104·3	52·2
Rubidium	Rb'	85·3	85·4
Ruthenium	Ru^{iv}	104·2	26·0
Scandium	——	——	——
Selenium	Se^{vi}	79·5	39·7
Silicon (Silicium)	Si^{iv}	28	7·0
Silver	Ag'	108	108·0
Sodium (Natrium)	Na'	23	23·0
Strontium	Sr''	87·5	43·75
Sulphur (S'' & S^{iv})	S^{vi}	32	16·0
Tantalum	Ta^{v}	182	36·4
Tellurium	Te^{vi}	129	64·0
Terbium (?)	——	——	——
Thallium	Tl''	204	204·0
Thorinum (Thorium)	Th''	232	57·87
Tin (Sn'')	Sn^{iv}	118	59·0 / 29·5
Titanium	Ti^{iv}	50	12·5
Tungsten	W^{vi}	184	46·0

Elements.—*Continued.*

	Symbol and Atomic Value.	Atomic Weight.	Equivalent Weight.
Uralium	——	——	——
Uranium	U^{vi}	120	60·0
Vanadium	V^{v}	51·3	17·1
Yttirbium	——	——	——
Yttrium	Y''	61 7	30·85
Zinc	Zn''	65	32·6
Zirconium	Zr^{iv}	89·5	22·4

—*Am. Annual of Photography.*

Elemi.—The elemi of commerce is of a pale yellow color, exteriorly brittle, but soft and tough within; it has a warm, bitter taste and a fragrant aromatic smell, partaking of fennel and juniper. It is only partially transparent, even in thin plates, is very fusible and has a density a little greater than that of water. According to Bonastre, it consists of 84% of resin, 12·15% of a fragrant essential oil and a little bitter extractive. In medicine it is only employed in the preparation of the elemi ointment of the Pharmacopœia.

Eliquation.—Separation of lead and silver from copper. A process formerly used for the separation of silver from copper by means of lead. The three metals were melted together, cast into disks and suddenly cooled. By exposing these disks to a red heat the lead melted and separated or liquated from the copper, carrying the greater portion of the silver with it, the copper remaining in a spongy mass having the form of the original disk.

Elixir of Monobromated Camphor.—Monobromated camphor, 3 parts; alcohol, 90%, 120 parts; orange flower water, 80 parts; glycerine, 100 parts; mix alcohol and glycerine; dissolve the monobromated camphor by use of heat, add the orange flower water. This solution contains 1% of monobromated camphor.

Elutriation.—Cleansing by washing and at the same time separating the substance (an insoluble powder) into different degrees of fineness. The coarse powder settles first, then the supernatant liquor is decanted and the sediment drained and dried. It is of the greatest use in the mechanic arts, and the process is so simple that it can be performed by any one.

Embalming.—*Wickersheimer's Preserving Fluid.*—According to the Boston *Journal of Chemistry*, the following is said to be the formulæ now adopted by prominent manufacturers in Berlin for this liquid, according as it is to be used for injecting or immersing bodies.

	For injecting.	For immersing.
Arsenious acid	16 grm.	12 grm.
Sodium chloride	80 grm.	60 grm.
Potassium sulphate	200 grm.	150 grm.
Potassium nitrate	25 grm.	18 grm.
Potassium carbonate	10 grm.	15 grm.
Water	20 lit.	10 lit.
Glycerine	4 lit.	4 lit.
Wood naphtha	¾ lit.	¾ lit.

Hager suggests the following as a substitute for Wickersheimer's preparation:

Salicylic acid	4 drm.
Boracic acid	5 drm.
Potassium carbonate	1 drm.
Dissolved in hot water	12½ oz.
Glycerine	5 oz.

Then add—

Oil cinnamon, oil cloves, each 3 drm., dissolved in alcohol..... 12½ oz.

The latter fluid is not poisonous, and possesses the desirable property of acting as an antiseptic, and also as a preventive and exterminator of moths and vermin, and is possessed of a pleasant odor. The borosalicylate may be used in connection with other solvents if desired.

See also **Dead,** *Preservation of.*

Embossing and Gilding Glass. See **Glass.**

Embrocation.—A fluid medicine for external and local use. Embrocations do not differ materially from liniments and lotions, and are applied in the same manner.

Emery.—*Emery Belts.*—Take emery or sharp sand, spread it out on an iron plate heated to about 200° F. Apply to your straps or belts a rather thin coating of strong glue, then press it upon the heated emery or sand. Either leather or cotton webbing may be used for the belt.

Emery, to Clean. See **Cleansing.**

Emery Cloth.—Apply a coating of thin glue and sift the powder on through a sieve. Have the emery sifted according to the fineness.

Emery Blocks.—These are prepared only on a scale which is beyond the amateur, but an excellent emery cake can be made by mixing emery powder with wax.

Emery to Fasten to Leather.—To fasten emery to leather, boil glue very thin, add a little milk, raise the pile of the leather and put on the glue with the brush. Then sprinkle on the emery and let it cool.

Emery Paper. See **Paper.**

Emery Paste.—Mix the finest emery obtainable with a little suet.

Emery, Preparation of, for Optical Purposes.—Mix 4 lb. of flour emery with 1 oz. of powdered gum arabic, then throw the powder into 2 gal. of clean water. Collect the deposits at the end of ten, twenty, thirty seconds, etc., to sixty minutes. Use in the order of time in which they were precipitated, using the longest last.

Emery Strap.—The emery strap is made by brushing good strong glue upon the leather and quickly sprinkling the surface with flour of emery; when dry, the loose emery is brushed off. Crocus is mixed with a little oil and rubbed into the leather. Smooth on piece of glass.

Emery Wheels and Sticks.—Turn wheels from well seasoned pine, of the form desired; place emery upon an iron plate heated to 200° to 212°; coat the wheels with glue prepared as for uniting wood, and roll the wheels in the warm emery. After the glue dries, the surplus emery brushed off and another coating of glue is applied and the wheels are again rolled in the warm emery. The wheels should be allowed to become thoroughly dry before use. Prepare sticks of such forms as you may require, and coat them as directed for emery wheels, or attach to them paper by means of glue or paste.

To Make Emery Wheels.—Turn a wheel of pine, coat the wheel with good glue and roll it in emery which has been heated on an iron plate to 200° F. As one coat will not last long, several should be given.

Emery Wheels, to Remove Gloss of.—There are tools sold by the dealers in emery wheels that break up the surface or true it, when glossy or out of true. Hydrochloric or nitric acid will clean a metalized wheel. Swab the surface with the acid, let it lie fifteen to twenty seconds, and quickly wash the surface clean with water and dry.

Emery Wheels, to True.—Hold a piece of white chalk against the wheel while in motion. This will show you the high places. Then take a pick of the kind used to dress millstones, or make one of a file about five inches long, wedged in a stick like a miller's pick. Hack the chalked places and keep chalking and hacking, rubbing over with an old file each time before chalking, until the wheels true and the chalk touches all around.

Emery Wire.—Oil the wire and sprinkle emery over it.

Emetics.—Medicines which induce vomiting. The principal emetics are ipecacuanha, and tartarized antimony and their preparations; and the sulphates of zinc and copper. A wine glass of warm water, a teaspoonful of salt, and a quarter wine glassful mustard.

Emulsion Photographic. See **Photography.**

Emulsions. See **Cosmetics.**

Emulsions.—These are milky liquids, formed by the mechanical admixture of oil, balsam, or resin, with water, by means of some other intervening medium, generally saccharine or mucilaginous, and to emulsify an oil consists in rendering it capable of mixing with water to form a uniform milky fluid—by means of such aid. The common name of emulsions is milk; but the term is often incorrectly extended to opaque white liquids of an entirely distinct character.

The successful formation of emulsions, whether of fixed or volatile oils, is dependent upon certain rules, well understood by accomplished pharmacists, which, when deviated from, will invariably embarrass the operator, either by retarding or completely preventing perfect emulsification. These rules are:

1. That the water and gum arabic shall be in definite and absolute proportion to each other. This proportion is 3 parts of water to 2 parts of gum, both by weight.

2. That the relation of oil to gum (and water) shall be definite within certain limits; that is to say, the mucilage formed in the above proportions is capable of perfectly emulsifying a minimum and a maximum proportion of oil. The minimum proportion is 2 parts of oil to 1 part of gum; the maximum proportion is 4 parts of oil to 1 part of gum.

3. That the trituration of the oil, gum, and water be continued until a perfectly homogeneous, milky white, thick creamy mixture is formed—*i. e.*, until perfect emulsification takes place—before the addition of a further quantity of water or other liquid.

The thick creamy emulsion obtained, if the above conditions are fulfilled, must be the basis of all perfect emulsions. It will bear dilution to any extent with water, forming mixtures varying, according to the proportion added, from the appearance and consistence of cream to that of very thin milk. Obviously the water may be substituted by solutions of saline compounds, sirups, etc., and this enables the production of the various combinations of codliver oil in current use from the above thick creamy emulsion, which for distinction I shall designate as—

1. Concentrated Emulsion of Codliver Oil.—Take of fresh Norwegian codliver oil, 8 troy oz.; powdered gum arabic, 2 troy oz.; distilled water, 3 troy oz. First weigh the gum into a Wedgwood or porcelain mortar, then the oil, and triturate till the gum is well mixed with the oil; then weigh into the mixture the distilled water, and triturate the whole briskly until the mixture thickens and acquires a pasty consistence and milky whiteness. Now scrape down the portions adhering to the sides of the mortar and the pestle, and continue the trituration for a short time, after which add such other ingredients as may be desirable, or transfer the concentrated emulsion to a wide-mouthed bottle for future use.

This concentrated emulsion will keep for a reasonable time in cold weather, and, if placed in the ice-chest, also during warm weather. It may, therefore, be kept in stock if the demand for emulsions is brisk enough to justify it; but

inasmuch as its preparation does not consume more than five or ten minutes, it is advised to always prepare it fresh, or, at all events, never to prepare more than a week's supply, particularly in summer. Its consistence is such that it is poured out of the containing vessel with difficulty; hence the necessity of using one with a wide mouth, which should be as securely stoppered as possible, and should be cleaned very carefully each time it is refilled. All this takes time and involves trouble, which is prevented by preparing the concentrated emulsion only as required.

2. Simple Emulsion of Codliver Oil.—Take of concentrated emulsion of codliver oil, 13 troy oz.; oil of wintergreen, 24 drops; sirup, 1 fl. oz.; water, 3 fl. oz. Weigh the concentrated emulsion into a mortar, add the oil of wintergreen, and triturate thoroughly, then gradually add first the water and then the sirup.

The manipulation for this emulsion is typical for all the other codliver emulsions given below. It has the consistence of very thick cream, but is readily poured out of narrow mouthed bottles, is milky white, and mixes readily with water or other liquids, that may be administered with it. It contains exactly 50% (by volume) of oil, the quantity that manufactured emulsions are said to contain, although we are now convinced that some of them do not contain that proportion. The oil of wintergreen disguises the odor of the codliver oil very admirably, and has the further advantage that it acts as a preservative.

3. Emulsion of Codliver Oil with Hypophosphite of Lime.—This differs from the simple emulsion in that 128 grn. hypophosphite of calcium are dissolved in the water, each tablespoonful of the finished emulsion containing 4 grn. of that salt.

4. Emulsion of Codliver Oil With Hypophosphites of Lime and Soda.—This differs from the simple emulsion in that 128 grn. hypophosphite of calcium and 96 grn. hypophosphite of sodium are dissolved in the water, each tablespoonful of the finished emulsion containing 4 grn. of the calcium and 3 grn. of the sodium salt.

5. Emulsion of Codliver Oil with Hypophosphites.—This differs from the simple emulsion in that 128 grn. hypophosphite of calcium, 96 grn. hypophosphite of sodium, and 64 grn. hypophosphite of potassium, are dissolved in the water; each tablespoonful containing 4 grn. of the calcium, 3 grn. of the sodium, and 2 grn. of the potassium salt, and corresponding to a teaspoonful of Churchill's sirup of the hypophosphites.

6. Emulsion of Codliver Oil with Phosphate of Lime.—This differs from the simple emulsion in that 256 grn. phosphate of calcium are dissolved in the water by the aid of 128 grn hydrochloric acid; each tablespoonful containing 8 grn. of the phosphate held in a pleasantly acid solution.

7. Emulsion of Codliver Oil with Phosphate of Lime and Soda.—This differs from the simple emulsion in that 256 grn. phosphate of calcium and 64 grn. phosphate of sodium are dissolved in the water, acidulated with 128 grn. hydrochloric acid, each tablespoonful containing 8 grn. of the calcium and 2 grn. of the sodium salt.

8. Emulsion of Codliver Oil with Lactophosphate of Lime.—This differs from the simple emulsion in that 256 grn. lactate of calcium dissolved in 2 fl. oz. of diluted phosphoric acid are substituted for 2 fl. oz. of the water, each tablespoonful containing 8 grn. lactate of lime or about 10 grn. lactophosphate.

9. Emulsion of Codliver Oil With wild Cherry Bark.—This differs from the simple emulsion in that the oil of wintergreen is substituted by 8 drops oil of bitter almonds, and in that 1 fl. oz. of the fluid extract of wild cherry bark is substituted for 1 fl. oz. of the water, each tablespoonful containing 15 minims of the fluid extract and ¼ drop oil of bitter almonds.

Other combinations of codliver oil with different medicinal agents may be effected in the same way as pointed out in the above, or the proportions of salts may be varied to suit particular cases. The process for the concentrated emulsion also may be applied to the emulsification of other oils; as, for instance, in the following:

10. Emulsion of Castor Oil.—Take of castor oil, 4 troy oz.; powdered gum arabic, 1 troy oz.; distilled water, 1½ troy oz.; sirup, cinnamon water, of each 3 fl. oz.; spirit of cinnamon, 12 minims. Emulsify the oil with the gum and distilled water as directed under 1, then add the other ingredients successively with constant trituration. The emulsion contains 33% of castor oil, and is consequently more limpid than the 50% codliver oil emulsions above described, and is in every respect an elegant preparation.—*Louisville Med. News.*

Emulsions, to Prepare.—Emulsions, or mixtures (*Misturæ. U. S. P.*), are milky liquids, formed by the mechanical admixture of oily or resinous substances with watery fluids, by the intervention of gum arabic, the yelk of an egg or some other substance that has the property of combining with both. A drachm of thick mucilage, made with equal parts of gum arabic and water (the powdered gum is sometimes used instead of the mucilage), or the yelk of an ordinary-sized egg, will form 2 drm of oil or resinous matter into an emulsion with about 1 fl. oz. of water gradually added. As emulsions made with yelk of egg will not generally keep long, mucilage is usually employed. Oils, as a rule, require about three-fourths of their weight; balsam about equal parts; and resins about twice their weight.

It is found that volatile oils are more readily made into emulsions if mixed with an equal volume of some simple fixed oil, as that of the almond or olive, before proceeding to operate on them. All emulsions should be well shaken before use.

Emulsions, a New Patent. (*A. Blackie, No. 3,466. 1886.*).—This invention is described as improvements in the preparation of emulsions of vegetable, animal, and mineral oils; of solid paraffins, waxes, and fatty substances; and of liquids which are insoluble, or but partially or slightly soluble, in water. A solution of gelatine or other similar substance is made, in the proportion of 4 oz. to the gal. of water. In 12 parts of this 1 part of phosphate of soda or potash, or carbonate of soda or potash, is dissolved by the aid of heat, and this mixture is capable, by the ordinary means, of emulsifying from 24 to 36 parts of animal or vegetable oils. For embrocations ammonia is substituted for the above-named salts. Chloroform and such liquids may be emulsified in the above manner. For mineral oils and the like the alkali is replaced by soft soap. For example, an emulsifying solution is made with 6 oz. of concentrated size, 1 lb. of soft soap, and 1 gal. of water, and this mixture is capable of emulsifying 2 gal. of paraffin oil. Either of the solutions named is applicable for preparing leather dressing, sheep washes, and the like, and for the latter purpose the inventor claims the addition of alkaline sulphides, sulphur, arsenic, and other substances.—*Chemist and Druggist.*

Enamels.—*Emaux*, Fr. *Schmelzglas*, Ger.—Transparent or opaque substances, usually formed of glass colored with metallic oxides and applied in a thin stratum to brightly polished metallic surfaces (copper or gold), on which they are fused by the flame of a lamp urged by the blowpipe, or by the heat of a small furnace, and in cooling form a sort of vitreous varnish. The art of enameling acquired the greatest perfection in ancient times, and very beautiful specimens are still preserved which the moderns are unable to equal, and with the materials of which they are totally unacquainted. At the present day this pleasing and useful application of human industry is carried on with the greatest success by the

Venetians and, after them, by the French. The limits of this work will not permit a description of the various operations of enameling, which essentially depend on skillful manipulation; a knowledge of which can only be obtained by long practice.

The basis of all enamels is a highly transparent and fusible glass, which readily receives a color on the addition of metallic oxides. As this is required in the preparation of many of those that follow, it is placed first.

Base or Flux for.—1. Red lead, 16 parts; calcined borax, 3 parts; powdered flint glass, 12 parts; powdered flints, 4 parts; fuse in a Hessian crucible for twelve hours, then pour it out into water and reduce it to a powder in a biscuitware mortar.—*Wynn, Trans. Soc. Arts, 1817.*

2. Powdered flints, 10 parts; niter and white arsenic, of each 1 part; as last.—*Wynn.*

3. Flint glass, 3 oz.; red lead, 1 oz.; as last.—*Wynn.*

4. Red lead, 18 parts; borax (not calcined), 11 parts; flint glass, 16 parts; as last.—*Wynn.*

5. Flint glass, 6 parts; flux No. 2 (above), 4 parts; red lead, 8 parts; as last.—*Wynn.*

6. Tin 2 to 5 parts; lead, 10 parts; calcine in an iron pot at a dull cherry red heat and scrape off the oxide as it forms, observing to obtain it quite free from undecomposed metal. When enough of the dross is obtained, reduce it to fine powder by grinding and elutriation, then mix 4 parts of this powder with an equal weight of pure sand or powdered flints and 1 part sea salt, or other alkaline matter; fuse the mixture in a Hessian crucible and proceed as before. The best proportions of the tin and lead, for all ordinary purposes, are about 3 of the former to 10 of the latter. The calcined mixed oxides are commonly called "calcine."

7. Lead and tin, equal parts; calcine as above, and take of the mixed oxides, or calcine and ground flints, of each 1 part; pure subcarbonate of potash, 2 parts; as before.—*Chaptal.*

8. Lead, 30 parts; tin, 33 parts; calcine as before, then mix 50 parts of the calcine with an equal weight of flints, in powder, and 1 lb. of salts of tartar; as before. A fine dead white enamel.—*Neri. Kunckel.*

The precise qualities of the products of the above processes depend greatly upon the duration and degree of the heat employed. By increasing the quantity of sand, glass or flux, the enamel is rendered more fusible, and the opacity and whiteness is increased by the addition of oxide of tin. The use of borax should be avoided or used very sparingly, as it is apt to make the enamel effloresce and lose color.—*Tillech.*

Black.—1. Pure clay, 3 parts; protoxide of iron, 1 part; mix and fuse. A fine black.—*Clouet.*

2. Calcined iron (protoxide), 12 parts; oxide of cobalt, 1 part; mix and add an equal weight of white flux.

3. Peroxide of manganese, 3 parts; zaffre, 1 part; mix and add it as required to white flux.

Blue.—1. Either of the fluxes colored with oxide of cobalt.

2. Sand, red lead and niter, of each, 10 parts; flint glass or ground flints, 20 parts; oxide of cobalt, 1 part, more or less, the quantity wholly depending on the depth of color required.

Brown.—1. Manganese, 5 parts; red lead, 16 parts; flint powder, 8 parts; mix.

2. Manganese, 9 parts; red lead, 34 parts; flint powder, 16 parts.—*Wynn.*

Green.—1. Flux, 2 lb.; black oxide of copper, 1 oz.; red oxide of iron, ½ drm.; mix.

2. As above, but use the red oxide of copper. Less decisive.

3. Copper dust and litharge, of each, 2 oz.; niter, 1 oz.; sand, 4 oz.; flux, as much as required.

4. Add oxide of chrome to a sufficient quantity of flux to produce the desired shade. When well managed the color is superb and will stand a very great heat; but in common hands it frequently turns on the dead-leaf tinge.

5. Transparent flux, 5 oz.; black oxide of copper, 2 scruples; oxide of chrome, 2 grn. Resembles the emerald.

6. Mix blue and yellow enamel in the required proportions.

Olive.—Good blue enamel, 2 parts; black and yellow enamel, of each 1 part; mix. (See also *Brown Enamels.*)

Orange.—1. Red lead, 12 parts; red sulphate of iron and oxide of antimony, of each 1 part; flint powder, 3 parts; calcine, powder and melt with flux, 50 parts.

2. Red lead, 12 parts; oxide of antimony, 4 parts; flint powder, 3 parts; red sulphate of iron, 1 part; calcine, then add flux, 5 parts to every 2 parts of this mixture.—*Wynn.*

Purple.—1. Flux colored with oxide of gold, purple precipitate of cassius, or peroxide of manganese.

2. Sulphur, niter, vitriol, antimony and oxide of tin, of each 1 lb.; red lead, 60 lb.; mix and fuse, cool and powder, add rose copper, 19 oz.; zaffre, 1 oz.; crocus martis, 1½ oz.; borax, 3 oz.; and 1 lb. of a compound formed of gold, silver, and mercury; fuse, stirring the melted mass with a copper rod all the time, then place it in crucibles, and submit them to the action of a reveberatory furnace for twenty-four hours.—*Phil. Mag.*

This is said to be the purple enamel used in the mosaic pictures of St. Peter's at Rome.

Red.—1. Sulphate of iron (calcined dark), 1 part; a mixture of 6 parts of flux (4) and 1 of colcothar, 3 parts; dark red.—*Wynn.*

2. Red sulphate of iron, 2 parts; flux (No. 1.), 6 parts; white lead, 3 parts; light red.—*Wynn.*

3. Paste or flux colored with the red or protoxide of copper. Should the color pass into the green or brown, from the partial peroxidizement of the copper, from the heat being raised too high the red color may be restored by the addition of any carbonaceous matter, as tallow, or charcoal.

4. The most beautiful and costly red, inclining to the purple tinge, is produced by tinging glass or flux with the oxide or salts of gold, or with the purple precipitate of cassius, which consists of gold and tin. In the hands of the skillful artist, any of these substances produce shades of red of the most exquisite hue; when most perfect, the enamel comes from the fire quite colorless, and afterward receives its rich hue from the flame of a candle or lamp, urged by the blow-pipe.

Rose-colored.—Purple enamel, or its elements, 3 parts; flux, 90 parts; mix and add silver leaf, or oxide of silver, 1 part or less.

Transparent.—Either of the fluxes, except the last three. (See also *Pastes.*)

Violet.—Saline or alkaline frits or fluxes colored with small quantities of peroxide of manganese. As the color depends on the metal being at the maximum of oxidation, contact with all substances that would abstract any of its oxygen should be avoided. The same remarks apply to other metallic oxides

Yellow.—1. Red lead, 8 oz.; oxide of antimony and tin, calcined together, of each 1 oz.; mix and add flux (No. 4) 15 oz.; mix and fuse.—*Wynn.* By varying the proportion of the ingredients various shades may be produced.

2. Lead, tin ashes, litharge, antimony and sand, of each 1 oz; niter, 4 oz.; mix, fuse and powder; and add the product to any quantity of flux according to the color required.

3. White oxide of antimony, alum and sal ammoniac, of each 1 part; pure carbonate of lead, 1 to 3 parts, as required; all in powder; mix and expose to a heat sufficiently high to decompose the sal ammoniac. Very bright.

4. Flux fused with oxide of lead, and a little red oxide of iron.

5. Pure oxide of silver added to the metallic fluxes. The salts of silver are also used, but are

difficult to manage. If a thin film of oxide of silver be spread over the surface of the enamel to be colored, exposed to a moderate heat, then withdrawn and the film of reduced silver on the surface removed, the part under will be found tinged of a fine yellow.

Superior yellow enamels are less easily produced than most other colors; they require but little flux and that mostly of a metallic nature.

White.—1. Calcine (2 parts of tin and 1 part of lead calcined together), 1 part; fine crystal or frit, 2 parts; a very trifling quantity of manganese; powder, mix, melt and pour the fused mass into clean water; dry, powder, and again fuse and repeat the whole process 3 or 4 times, observing to avoid contamination with smoke, dirt, or oxide of iron. A fine dead white.

2. Washed antimony, 1 part; fine glass (perfectly free from lead), 3 parts; mix and proceed as before. Very fine.

For white enamel, the articles must be perfectly free from foreign admixture, as this would impart a color. When well managed, either of the above forms will produce a paste that will rival the opal.—*Cooley.*

These formulas are old, but still are reliable. Refer also to the *Miscellaneous Enamels* below.

Black Enamel for Wood.—Prime the wood with linseed oil, turpentine and white lead; then give it two or three coats of black, mixed with copal varnish and turpentine. Rub it down when dry with pumice stone and water; finally varnish with copal; again rub down and polish with oil and rotten stone, to obtain a perfect smoothness.

Black for Writing on White Enamels.—Use vegetable black mixed with a hard drying varnish, and thinned with boiled oil and turpentine.

Enameling Iron Vessels.—For enameling cast and wrought iron vessels, two compositions are in use; one has for its base silicate of lead and the other boro-silicate of soda. One of these enamels is applied to the scoured surface of the metal in the form of a powder, which is fixed by heating to a sufficiently high temperature to fuse; it then spreads over and covers the metal with a vitreous varnish. The boro-silicate of soda possesses great superiority over the silicate of lead, for it is not attacked by vinegar, marine salt, or the greater number of acid or saline solutions, even when concentrated, and resists the action of agents used in cooking or chemical operations. The silicate of lead enamel is whiter and more homogeneous, which explains the preference given it by the public, but it gives up oxide of lead to vinegar or to common salt; it acts upon a great number of coloring matters, and it is attacked by nitric acid, which communicates a dull color to it. On evaporation the liquid leaves a white crystalline residue of nitrate of lead. This enamel is instantly darkened by dissolved sulphides, and also by cooking food containing sulphur, such as cabbage, fish and eggs.

2. To color the enamel green, mix with it before heating 1 to 2 parts of oxide of chromium to 10 parts enamel.

3. For blue, use prepared cobalt, red lead, niter, each 1 oz.

4. For yellow, use lead and tin ashes, litharge and antimony, each 1 oz., and niter 4 oz.

5. Gold and purple of cassius are used for red and purple.

6. For black, use calcined iron and cobalt, each 1 oz., or zaffre 2 oz., manganese 1 oz.

Cards, Enamel on.—The glaze upon enameled cards is made by pressure upon a polished plate or rollers. The composition is chalk, clay and a little starch. Good work is not possible without elaborate accessories.

Carboard, To Enamel.—Cardboard is treated with a surface of white lead and size laid on by a round badger's hair brush. A powder of talc (silicate of magnesia) is rubbed upon the dried surface of the lead, and the face is then polished by the brush.

Enamel, Black for Cycles.—Asphalt, 40 oz.; boiled linseed oil, ½ gal.; litharge, 6 oz.; powdered zinc sulphate, 4 oz.; red lead, 6 oz.; litharge, 6 oz. Melt the asphalt, add the others; boil 2 hours, stir in 8 oz. fused dark amber gum and 1 pt. hot linseed oil; boil 2 hours more. When mass has thickened remove from the fire and thin 1 gal. turpentine.

Enameled Cast Iron.—Clean and brighten the iron before applying. The enamel consists of two coats—the body and the glaze. The body is made by fusing 100 lb. ground flints, 75 lb. borax and grinding 40 lb. of this frit, with 5 lb. of potter's clay in water, until it is brought to the consistence of a pap. A coat of this being applied and dried, but not hard, the glaze powder is sifted over it. This consists of 100 lb. Cornish stone in fine powder, 117 lb. borax, 35 lb. soda ash, 35 lb. niter, 35 lb. sifted slaked lime, 13 lb. white sand, 50 lb. of pounded white glass. These are all fused together, the frit obtained is pulverized. Of this powder 45 lb. are mixed with 1 lb. of soda ash in hot water, and the mixture dried in a stove is the glaze powder. After sifting this over the body coat the cast iron article is put into a stove, kept at a temperature of 212° to dry it hard, after which it is set in a muffle kiln to fuse it into a glaze. The inside of pipes may be enameled (after being cleaned) by pouring the above body composition through them while the pipe is being turned around to insure an equal coating. After the body has become set the glaze pap is poured in in the same manner. The pipe is then fired in the kiln.

Porcelain Enamel, for Iron.—Flint (quartz), calcined and ground, 100 lb.; borax glass (anhydrous borax) ground, 50 lb. Mix, fuse together in a crucible and let it cool slowly. Powder and mix 40 lb. of this glass with 5 lb. of kaolin (white potter's clay) and grind the mixture to a fine paste in water; pickle the vessel in dilute sulphuric acid and scour with sand to thoroughly cleanse its surface; then line it with a coating of the above paste about one-sixth of an inch thick, and let it stand in a warm room until the coating has partially dried. Next dust over the surface of the paste coating (still moist) the following powder, and dry it in an oven at 212° F.: White glass, free from lead or arsenic, 125 lb., borax, 25 lb.; carbonate of soda, fused, powdered, moistened with water and dried, 20 lb. To 45 lb. of this add 1 lb. soda. Mix thoroughly with a little hot water, dry and reduce to fine powder. When the coating on the iron has dried, the vessel is put in a muffle and the heat gradually increased until the glaze fuses, when it is taken out, more glaze powder is dusted on and after a second heating allowed to cool very slowly. Some of the glazes employed consist of friable mixtures of feldspar, sodium carbonate, borax and oxide of tin. Feldspar is also sometimes added to the enamel body.

To Enamel Cast Iron and Hollow Ware.—1. Calcined flints, 6 parts; Cornish stone or composition, 2 parts; litharge, 9 parts; borax, 6 parts; argillaceous earth, 1 part; niter, 1 part; calx of tin, 6 parts; purified potash, 1 part.

2. Calcined flints, 8 parts; red lead, 8 parts; borax, 6 parts; calx of tin, 5 parts; niter, 1 part.

3. Potter's composition, 12 parts; borax, 8 parts; white lead, 10 parts; niter, 2 parts; white marble calcined, ½ part; purified potash, 2 parts; calx of tin, 5 parts.

4. Calcined flints, 4 parts; potter's composition, 1 part; niter, 2 parts; borax, 8 parts; white marble calcined, 1 part; argillaceous earth, ½ part; calx of tin, 2 parts. The above compositions must be finely powdered, mixed and fused. The vitreous mass is to be ground when cold, sifted and levigated with water. It is then made into a pap with water or gum water. This pap is brushed over the interior of the vessel, dried and fused with a proper

heat in a muffle. Clean the vessels thoroughly before applying.

Enamel for Labels, etc. (Duchemin).—Arsenic, 24 parts by weight; saltpeter, 24 parts; silica (fine sand), 72 parts; litharge, 200 parts. This mixture is spread on plates of glass which are not inferior in point of fusibility to the enamel. Glass thus prepared may be drawn or written on as readily as if it were paper, and the writing may be rendered indelible by heating the plate in a small open furnace or muffle. Labels for horticultural purposes, signboards, show cases, signs, etc., may thus be cheaply made. Photographs may be taken on this enamel.

Miscellaneous Enamels.—1. Enamel Blue.—Sixty-four oz. flint glass, 20 oz. red lead, 4 oz. pearlash, 8 oz. white enamel, 4 oz. common salt, 6 oz, best blue calx. To be run down in the glost oven, then ground, and add 4 oz. of red lead; then grind it, and it will be fit for use.

2. Twenty-six oz. zaffre, 18 oz. pearlash, a teaspoonful of charcoal.

3. Violet Blue.—Four oz. tartar, 2 oz. red lead, 5 oz. flint, ½ oz. magnesia.

4. Fourteen parts glass, 5 parts red lead, 1 part white enamel, 2 parts blue calx. Good.

5. Ten parts glass, 5 parts red lead, 2 parts niter, ½ part white enamel, calcined, ½ part blue calx. Good.

6. Flux for Blue.—Sixteen lb. flint, 2 lb. lead, 2½ lb. borax, 1 lb. pearlash.

7. Yellow.—Eight of litharge, 6 of flint, 3 of antimony, 2 of ocher, 4 of glass.

8. Three of litharge, 4 of powdered brick, 1 oxide of iron, 3 of antimony; to be calcined in glost oven and spread on glost plates.

9. Flux for Yellow.—Three oz. red lead, 1 oz. flint.

10. Enamel Yellow.—Six lb. white lead, ⅛ lb. flint, ½ lb. tin ashes; to be mixed well together, run down in an enameling heat, and poured into warm water.

11. Carnelian Red.—One part chromate of iron, 3½ parts flux.

12. Flux.—Three parts red lead, 1 part glass, 1 part flint. No other flux will do for this. The flux must be highly calcined until it forms a dark glass.

13. Enamel Red.—Three of litharge, 2 of antimony, 1 of iron scales.

14. One of litharge, 1 of antimony, ½ of iron scales, red and yellow, to be spread on plates in glost oven.

15. Flux for Red.—Six oz. of red lead, 4 oz. borax, 2 oz. flint glass. To be run down over common fire.

16. Pink.—One hundred lb. oxide of tin, 50 lb. chloride of lime, 5 lb. oxide of chrome; 10 of the foregoing to 1 of flint.

17. Rose Colors.—One grn. of gold dissolved in aquaregia, 4 of block tin dissolved in same; pour each separately into a basin of cold water, then drop in the tin, when dissolved, and stir with a feather; then let it stand six hours, until precipitated; then wash it in hot water after which add the following: 3 parts borax, 1 part flint and 1 part calx.

18. Rose Flux.—Fourteen parts glass, 5 parts red lead.

19. Crystal Enamel.—Dissolve 1 oz. white lac in 10 oz. warm alcohol. Let the mixture stand for some weeks, then decant the clear portion for use.

Millway Vanes says (*Sci. Am. Supp.*, No. 387): "I place little importance on these, as they might be had in any quantity. When in a powdered state and well ground, they are ready for mixing with the proper vehicles on the color slab. These vehicles are raw turpentine, the oil of turpentine and the oil of tar. The turpentine is placed in a gallipot, which is again placed in a saucer. The turpentine, in time, fattens and creeps over the edge of the gallipot into the saucer and 'fattens' into the oil of turpentine, which can be thinned by raw turpentine for use. To this should be added another gallipot and saucer, containing tar oil. Now here comes the technical use of these vehicles. The colors should not be made too fat, or left too raw. I have said that the lights in enamel painting are taken out by the pencil—always a camel hair one. If the color be too fat this cannot be cleanly done, or if it be too raw a similar evil is encountered. To perfect the color, in use, a little tar oil is mixed with it, and occasionally used in taking out the lights. This was the manipulation, or *modus operandi*, of one of the greatest painters—one of the finest wild flower painters in the world; and in my experience I have followed the same practice with the best results.

To the camel hair pencil should be added the stick, or holder, which performs some of the most important work in the art of enamel painting. It should be made of alder wood, and sharpened at the end away from the pencil. With this the artist takes out the sharpest and most brilliant lights of the picture, occasionally cleaning the end of the pencil stick on the front of his working coat, and then wetting on the tip of his tongue for a cleaner touch.

There are no art materials, possibly, so diversified in quality as enamel slabs for painting on, and enamel colors for use in enamel pictures All these colors, being of a mineral character, require the best chemical mixing and the finest grinding. Rose colors and purple, having bases of gold, are sometimes tampered with in the use of a baser material in the manufacture of those colors; and blues and reds are difficult of obtaining for pure art purposes. A great enamel artist used in his blues a little chloride of sodium, or common salt; and his rose colors and purples were generally of the first make. This artist had worked in England on the finest wares, at Swansea, Worcester, Coalport, Chelsea, the Staffordshire potteries, and elsewhere. Specimens of his clever work might now be seen at the Liverpool Museum. At the great works of Minton's and Copeland's, he was one of the first hands; and no doubt is now well remembered by those who do honor to the trade. From these great manufactories the best of colors might be obtained, not by purchase, but from the kindness of the employers, who are ever ready to assist in the development of art, as the quantity required for art purposes and amateur use is so very small.

Having secured an unblemished porcelain slab, or other porcelain article, the subject might be sketched in with a little Indian ink, rubbed up in water, then the work is commenced for the first firing. The work can either have a background or can be painted without one; and here the skill of the artist is first tried. The background in the first coloring might be bossed in with a small dabber, and then the subject taken out and arranged, of course, according to the lights and darks and colors of the picture. First, second, third, and perhaps a fourth firing may be required as the work goes on, shadows darkening, tints brought out, and the background receiving the most beautiful and effective stippling, until at last this work of art stands out before the admiring gaze of the beholders, a finished work of technical ability, gorgeous in colors, most deep and rich in tone, and defying all the power of time in permanency of hues. But even here a few other touches might be required, and another firing given. To this end the artist, before alluded to used a little white enamel, mixed in water, giving the finest dots, as it were, for seed pearls, and the work was finished.

As before stated, enamel colors are prepared from the oxides of different metals with a vitreous flux. The principal colors are oxides of lead, platinum, chromium, uranium. Oxides of tin and antimony give opacity."

Enameling Metal.—The use of colored enamels on large surfaces is yet in its infancy. The ordinary gray enamel (so called) is really

not an enamel, but a transparent glaze, the apparent gray color of which is produced by the surface of iron beneath the glaze.

Gray Mixture Enamel.

Sand	10 lb.	0 oz.
Red lead	33 lb.	0 oz.
Boracic acid	20 lb.	0 oz.
Cullett (broken glass)	114 lb.	0 oz.
Bicarbonate of soda	16 lb.	0 oz.
Niter	1 lb.	2 oz.
Manganese	0 lb.	8½ oz.

Gray Mixture Enamel.

Flint	36 lb.	0 oz.
Boracic acid	24 lb.	0 oz.
Bicarbonate of soda	24 lb.	0 oz.
Niter	18 lb.	0 oz.

White Mixture Enamel.

Cullett	11 lb.	0 oz.
Boracic acid	7 lb.	0 oz.
Bicarbonate of soda	0 lb.	4 oz.
Phosphate of lime	3 lb.	8 oz.
Oxide of antimony	0 lb.	2 oz.

To Stamp with Gold on an Enameled Surface.—Use thin gold size and a hot brand.

Pasteboard and Paper, Enamel for.—Paper is enameled by coating with a mixture of 100 parts kaolin (perfectly dry) and 24 parts paraffin melted and mixed hot. After cooling it is reduced to powder and worked into paste in a paint mill with water, and then applied to the paper. Or try a mixture of dammar varnish and Chinese white. The last will strengthen the paper a little; the first will not.

Enamel Powders. See **Powders.**

Encaustic Paste. See **Photography.**

Enema.—A medicine usually liquid, sometimes gaseous, thrown into the rectum or lower bowels.

Engobe.—A thin layer of paste, or slip.

Engraving, Sand Blast.—Sand driven by an air blast of the pressure of 4 in. of water will completely grind or depolish the surface of glass in ten seconds. If the glass is covered by a stencil of paper or lace, or by a design drawn in any tough elastic substance, such as half dried oil, paint or gum, a picture will be engraved on the surface. Photographic copies in bichromated gelatine from delicate line engravings have been thus faithfully reproduced on glass. In photographic pictures in gelatin, taken from nature, the lights and shadows produce films of gelatin of different degrees of thickness. A carefully regulated sand blast will act upon the glass beneath these films more or less powerfully, in proportion to the thickness of the films, and the gradations of light and shade are thus produced on the glass. In the apparatus used air rises through a curved tube, carrying the sand up with it, which is thrown into the air tube by an endless belt of scoops arranged in the lower part of the angular box. The sand is carried up by the air and brought over and down the front air tube, where it discharges with great force upon the surface of the glass, which is contained within the front box and is carried by a belt gradually forward under the blast.

Engravings, to Bleach. See **Bleaching.**

Engravings, to Clean. See **Cleansing.**

Engraver's Border Wax. See **Waxes.**

Engraving Inks. See **Inks.**

Engravings, to Mount.—Strain thin muslin on a frame, then carefully paste on it the engraving, so as to be free from creases; afterward, and when dry, give the engraving two coats of thin size (made by putting a piece of glue the size of a small nut into a small cupful of hot water); finally when this dries, varnish the engraving with a varnish known as white hard. See also **Drawings.**

Engravings, to Transfer. See **Transferring.**

Entomologists, Cement for. See **Cements.**

Envelope, Safety.—A safety envelope may be made by treating that part of the paper covered by the flap with a solution of chromic acid, ammonia, sulphuric acid, sulphate of copper and fine white paper. The flap itself is coated with a solution of isinglass in acetic acid, and when this is moistened and pressed down on the under part of the envelope a solid cement is formed entirely insoluble in acids, alkalies, hot or cold water, steam, etc.

Epithem.—Any external liquid medicine for local application, as an embrocation or lotion. Some writers confine the term to those preparations which are intended to be applied by means of a cloth dipped in them.

Equivalence. See **Quantivalence.**

Erasive Soaps. See **Soaps.**

Ergot. *Syn.* Spurred Rye. Secale Cornutum. Ergota. Diseased Grains of Rye.—Ergot of rye deteriorates greatly by age. It is fed on by a description of acarus resembling the cheese mite, but much smaller, and this insect in time destroys the whole of the internal portion of the grain, leaving nothing but the shell and a considerable quantity of excrementitious matter. To prevent this the ergot should be well dried, and then placed in bottles or tin canisters, and closely preserved from the air. The addition of a few cloves or drops of the oil of cloves, or strong acetic acid, or a little camphor or comphorated spirit of wine will preserve this substance for years in close vessels.

Escharotics.—Substances that destroy the texture of living organic substances, with the production of an eschar or scab.

Escharotics, Painless.—1. A painless caustic for the removal of warts and tumors may be made as follows:

Arsenious acid	1 part.
Sulphate of morphine	1 part.
Calomel	8 parts.
Powdered gum arabic	48 parts.

This is to be sprinkled over the cuticle daily, the surface of which has been previously denuded by knife or blister.

2. Cauquoin's paste for the same purpose is composed of ten parts of chloride of zinc, two parts of alcohol (60°), and fifteen parts of wheat flour. The zinc in fine is added to the alcohol, then incorporated with the flour in a mortar, strongly pressing with the pestle. As soon as homogeneous it is spread with a roller into sheets an eighth of an inch thick, and after a few hours put into a well corked bottle.

3. Latour's nitrochloride of zinc paste is also an excellent preparation, and is made by dissolving fifty parts of the chloride and one hundred parts of the nitrate of zinc in eighty parts of water. The solution is made by the aid of heat. When it cools, seventy-five parts of wheat flour is incorporated with one hundred parts of the solution, as with Cauquoin's paste.

Esparto, Spanish Grass.—Used to a considerable extent in the manufacture of paper.

Esprit. See **Perfumes.**

Essence (Perfumery). See **Perfumes.**

Essence of Soaps. See **Soaps.**

Essences.—*Allspice.*—1 fl. oz. essential oil of allspice (pimento), 1 pint strongest rectified spirit; agitate till perfectly mixed; next day decant the clear from the sediment.

Almonds.—1. One fl. oz. essential oil of almonds, 1 pt. spirit; proceed as allspice.

2. One fl. oz. essential oil, 7 fl. oz. spirit.

Almonds—1. Essence of bitter almonds, essence of peach kernels, almond flavor.

Essential oil of almonds	1 fl. oz.
Rectified spirit (56 o. p.)	19 fl. oz.

Mix and agitate them together until united.

2. Concentrated essence of almonds, double E. of A. Take of—

Essential oil of almonds	1 fl. oz.
Rectified spirit (strongest)	9 fl. oz.

Mix. Used chiefly to impart the nutty aroma and flavor of bitter almonds and peach kernels to other preparations. The first is the common essence of the shops. Essences of other essential oils may be prepared in a similar manner. Many of them are now much used by confectioners and cooks, as well as in perfumery and cosmetics. It should be remembered that essence of almonds is poisonous.

Ambergris.—

1. Ambergris	5 drm.
Rectified spirit (63 to 66 o. p.)	1 pt.

Put them into a strong bottle or tin can, secure the mouth perfectly and very firmly and keep the vessel in a room exposed to the heat of the sun, or equally warm, for a month or two, observing to briskly agitate it daily during the whole time. Lastly, after repose, decant the clear portion, and, if necessary, filter it rapidly through bibulous paper. Very fine. It forms the strongest and finest simple essence of ambergris of the West End (London) and Paris houses.

2. Ambergris	2½ drm.
Rectified spirit	1 pt.

Digest, with frequent agitation, for 2 or 3 weeks. Good. Chiefly used as an element in other perfumes and preparations.

Ammoniacum.—1. One lb. ammoniacum in tears, bruised in a cold mortar with ½ lb. coarse, well washed, silicious sand or powdered glass; and ½ pint rectified spirit gradually added, trituration is continued till the whole is reduced to smooth paste, and it is then placed in a wide mouthed bottle with ½ pt. spirit of wine; digest for a week with frequent stirring, and after allowing to settle, decant the clear into another bottle for use.

Angelica.—1. Two oz. angelica root, 2½ oz. rectified spirit, 9 oz. water; digest, strain and evaporate.

2. Two lb. angelica root, 1 gal. rectified spirit; make a tincture; to the marc add 1 gal. proof spirit and repeat the digestion; filter the two tinctures separately, mix, distill off the spirit, and evaporate.

Anodyne.—1. One drm. powdered hard aqueous extract of opium, ½ drm. powdered cinnamon, 1 fl. oz. rectified spirit; digest a week.

2. Five drm. recent extract of henbane, 2 fl. oz. rectified spirit; digest a week.

Antihysteric.—3 grn. potassium cyanide, 1 drm. powdered sugar, 4 fl. drm. rectified spirit, 4 fl. drm. orange water; shake together till dissolved.

Apples.—Peel and reduce to pulp, 6 lb. unripe crab apples; add 1 lb. iron wire in small coils; digest in a vapor bath for about a week, express, strain, decant and evaporate in a porcelain vessel, with constant stirring, to the consistence of a soft extract; dissolve the residue in 4 parts water, strain and evaporate as before.

Apricot.—Butyric ether, 10 parts; valerianic ether, 5 parts; glycerine, 4 parts; amylic alcohol, 2 parts; amyl-butyric ether, chloroform, œnanthic ether, and tartaric acid, each 1 part.

Aromatic.—One drm. hay saffron, 6 fl. drm. rectified spirit; digest together, filter; to filtrate, add 1 drm. oil of cinnamon, 1 drm. powdered white sugar, 2 fl. drm. rectified ether, ½ drm. oil of nutmeg, ½ drm. essence of ginger; after shaking and a few days' repose, decant the clear.

Banana.—Banana essence, 2 oz.; citric acid, 1 oz.; alcohol, 70°, 2 pt.

Bark.—1. Four drm. resinous extract of yellow bark, 1½ fl. oz. rectified spirit, ½ fl. oz. tincture of orange peel, 1 fl. drm. acetic acid; digest a week.

2. One half drm. quinine disulphate, 2 drm. resinous extract of bark, 2 fl. oz. rectified spirit; digest a week.

Beef.—1. One lb. lean beef chopped small, ½ pt. water; put into large bottle and shake violently half an hour; strain the liquid into a jug; boil the solid residue in 1 pt. water for twenty minutes; strain, and add the liquid to the previous cold infusion; evaporate to consistence of thin sirup, add salt and spice to taste, and while boiling hot pour into cans or (previously heated) bottles, hermetically seal, and store in a cold place.

Birch.—First cut the oil. The essence is made as follows: Oil of birch or wintergreen, 1½ oz.; alcohol 95°, 12 oz.; water, 12 oz.

Bitter.—Four oz. wormwood, 1 oz. gentian root, 1 oz. bitter orange peel, 1 oz. blessed thistle, 45 oz. rectified spirit. Digest a week.

Blackberry.—Tincture of orris root (1 to 8), 1 pt.; acetic ether, 30 drops; butyric ether, 60 drops.

Blackberry.—Apple oil, 1 oz.; quince oil, 1 oz.; tincture of orris 1 oz.; tartaric acid, 1 oz.; alcohol, 70°, 2 pt.

Black Cherry, Essence of.—Benzoic ether, 5 parts; acetic ether, 10 parts; oil of persico (peach kernels) and benzoic acid, each 2 parts; oxalic acid, 1 part.

Camphor.—1. Four and a half oz clean camphor dissolved in 1 gal. rectified spirit.

2. One oz. camphor, 10 oz. rectified spirit.

3. Thirteen fl. drm. tincture of camphor, ½ fl. drm. tincture of myrrh, 18½ fl. drm. rectified spirit.

4. One fl. oz. spirit of camphor, 7 fl. oz. proof spirit.

5. One drm. camphor dissolved in 2½ oz. rectified spirit; add ½ oz. water.

6. One drm. powdered camphor dissolved in 12 fl. oz. water saturated with carbonic acid gas.

Cardamom.—Cardamom seeds, 600 gr.; alcohol at 85°, 10·5 l.; water, 5 l. Product, 10 l.

Catechu (Cachou).—Catechu, 600 gr.; alcohol, 85°, 10·5 l.; water, 5 l. Product, 10 l.

Cedrat.—Rinds of 60 fresh citrons; alcohol, 12 l. Macerate for twenty-four hours; at the time of distilling add 5 l. of water and distill; draw off 11 l. Rectify with 5 l. of water. Product, 10 l.

Celery.—1. Four and a half oz. bruised celery seed, 1 pt. proof spirit; digest 14 days, strain.

2. Seven oz. celery seed, 1 pt. rectified spirit; digest and strain as 1.

Cherry.—Benzoic ether, acetic ether, each 5 parts; glycerine, 3 parts; œnanthic ether and benzoic acid, each 1 part.

Cherry, Wild (Fluid).—Sixteen oz. wild cherry in fine powder, 4 oz. glycerine, 8 oz. water; mix the glycerine and the water, and digest the wild cherry in 8 oz. of the mixture for four days; pack in a percolator and pour on the remaining 4 oz. glycerine and water; when this has disappeared from the surface, pour on rectified spirit (0·817) until 12 oz. of fluid have been obtained, and set this portion aside. Then percolate with spirit until 20 oz. more have been obtained; evaporate to 4 oz. and mix with the reserved portion.

Cinnamon.—Cinnamon, pulverized, 300 grm.; alcohol 85°, 10·5 l.; water, 5 l. Macerate for twenty-four hours, distill over open fire. Rectify the product with 5 l. water over an open fire—product, 10 l.

Cochineal.—Two oz. cochineal, 2 oz. subcarbonate of potash, 2 oz. potash alum, 2 oz. cream of tartar, 20 oz. distilled water. Boil the cochineal and potash together for about ten minutes, then stir in gradually the cream of tartar and alum; strain through muslin, and afterward filter through paper. To the filtrate add ½ lb. lump sugar, and dissolve with gentle heat.

Coffee.—1. Four oz. coffee, 2 oz. chiccory, 1 oz. caramel (burnt sugar); prepared by percolation of the coffee with boiling water, gently and quickly evaporated to ½ or ¼ its bulk, adding a thick aqueous extract of the chiccory and sirup

of burnt sugar, so as to give the whole a consistence of molasses.

2. Use 3 pt. 90% rectified spirit, over 3 oz. finely ground coffee. Digest and filter.

Coltsfoot.—1. One oz. tolu balsam, 3 oz. rectified spirit, 3 oz. compound tincture of benzoin, dissolve; in a few days decant the clear.

2. One oz. tolu balsam, 1 oz. compound tincture of benzoin, 2 oz. rectified spirit.

3. Five fl. oz. tincture of tolu, 3 fl. oz. compound tincture of benzoin; 1 oz. quite dry powdered sugar, 1 drm. hay saffron; digest a week, with frequent shaking.

Coriander.—Coriander seeds, 12 k. 500 gr.; alcohol, 10.50 l.; water, 5 l.—product, 10 l.

Cubebs. — One-half lb. bruised or ground cubebs, 1 pt. rectified spirit; digest fourteen days, press, filter.

2. Four and one quarter lb. cubebs, 1 gal. rectified spirit.

3. Oleo Resinous.—1 oz. oleo resinous extract of cubebs dissolved in 3 oz. rectified spirit.

Cumin.—Cumin seeds, 1 kilo. 250 grm.; alcohol at 85° 10·50 liters; water, 5 liters; product, 10 liters.

Currant.—Acetic ether, tartaric acid, each 5 parts; benzoic acid, succinic acid, benzoic ether, aldehyde, and œnanthic acid, each 1 part.

Fruit Essences. Dingler's Polytechnic Journal gives the following table of the composition of artificial fruit essences, showing the number of parts of each ingredient to be added to 100 parts of alcohol—all chemically pure. Glycerine is found in all - it appears to blend the different odors, and to harmonize them:

	Peach.	Apricot.	Plum.	Cherry.	Black Cherry.	Lemon.	Pear.	Orange.	Apple.	Grape.	Gooseberry.	Raspberry.	Strawberry.	Melon.	Pineapple.
Glycerine	5	4	8	3	....	5	10	10	4	10	....	4	2	3	3
Chloroform	....	1	....	....	....	1	....	2	1	2	....	....	....	....	1
Nitric Ether	....	....	....	....	....	1	....	....	1	....	....	1	1	....	....
Aldehyde	2	....	5	....	....	2	....	2	2	2	1	1	....	2	1
Acetate of Ethyl	5	....	5	5	10	10	5	5	1	....	5	5	5	....	....
Formiate of Ethyl	5	....	1	....	....	....	....	1	....	2	....	1	1	1	....
Butyrate of Ethyl	5	10	2	....	....	....	....	1	....	....	....	1	5	4	5
Valerianate of Ethyl	5	5	....	....	....	....	....	....	....	....	....	....	....	5	....
Benzoate of Ethyl	....	....	....	5	5	....	....	1	....	....	1	1	....	....	....
Œnanthylate of Ethyl	5	1	4	1	2	....	....	....	....	10	1	1	....	....	....
Sebacic Ether	1	....	....	....	....	....	....	....	....	....	....	1	....	16	....
Salicylate of Methyl	2	2	....	....	....	....	....	1	....	1	....	1	1	....	....
Acetate of Amyl	....	....	....	....	....	....	10	10	....	....	....	1	3	....	....
Butyrate of Amyl	....	1	....	....	....	....	....	....	....	....	....	1	2	....	10
Valerianate of Amyl	....	....	....	....	....	10	....	....	10	....	....	....	....	....	....
Essence of Orange	....	....	....	....	....	....	....	10	....	....	....	....	....	....	....
Alcoholic solutions saturated in the cold of	Tartaric Acid	....	....	....	....	10	....	1	....	5	5	5	....	....	....
	Oxalic Acid	....	1	....	....	1	....	....	1	....	....	....	....	....	....
	Succinic Acid	....	....	....	....	....	1	....	....	3	1	1	....	....	....
	Benzoic Acid	....	....	....	1	2	....	....	....	....	1	....	....	....	....

Ginger.—1. Five oz. bruised unbleached Jamaica ginger, 1 pt. rectified spirit; digest a fortnight, press, filter.

2. As 1, with addition of very little essence of cayenne.

3. Three oz. grated ginger, 2 oz. fresh lemon peel, digested in 1½ pt. brandy for ten days.

4. Equal parts best unbleached Jamaica ginger in coarse powder, and silicious sand, sprinkled with enough rectified spirit of wine to perfectly moisten; after twenty-four hours, the mass is placed in a percolator, and after returning the first runnings two or three times, the receiver is changed, and more rectified spirit is poured on gradually and at intervals as repuired, until as much essence is obtained as there has been ginger employed.

5. Twelve lb. best unbleached Jamaica ginger in coarse powder digested in 2½ gal. rectified spirit for fourteen days; the expressed and strained tincture is reduced by distillation in a steam or water bath to 1 gal., cooled, transferred rapidly to stoppered bottles, and filtered.

6. Twenty-four lb. ginger as in 5, 6 gal. rectified spirit; make a tincture as before, and distill down to 1 gal.; cool as quickly as possible out of contact with the air, and add 1 gal. strongest rectified spirit of wine; filter if necessary.

7. Causes no turbidity with water or sirup. 1 lb. finest Jamaica ginger in powder, macerated in 8 oz. rectified spirit for several hours; add more spirit, and percolate to 16 oz.; add 2 oz. heavy carbonate of magnesia, agitate, and add 24 oz. water; shake well, and filter. If the filtrate is turbid, shake up with more magnesia, and filter again. It becomes turbid again after a few days' rest, but on filtering continues clear.—*Thresh.*

Grape.—Œnanthic ether, glycerine, each 10 parts; tartaric acid, 5 parts; succinic acid, 3 parts; aldehyde, chloroform and formic ether, each 2 parts; and methylsalicylic ether, 1 part.

Headache.—1. One drm. oil of lavender (Mitcham), 1 oz. camphor, 4 oz. liquor ammoniæ, 1 pt. rectified spirit; dissolve.

2. Two lb. spirit of camphor, 4 oz. strong water of ammonia, ½ oz. essence of lemon.

3. Two oz. camphor, 2 oz. liquor of ammonia, 4 drm. oil of lavender, 14 oz. rectified spirit. Very fragrant, stimulant, and rubefacient.

4. Two lb. spirit of wine, 2 oz. roach alum, 4 oz. camphor, ½ oz. essence lemon, 4 oz. strong water of ammonia, in a close-stoppered bottle; shake daily for three or four days.

Hop.—1. 26½ oz. new hops (rubbed small), 1 qt. proof spirit; digest twenty-four hours, then distill 1 pt. over (quickly), and set the disillate aside in a corked bottle; to the residue add 1 pint water, boil fifteen minutes, cool, express the liquor, strain, and evaporate as quickly as possible to dryness by a water bath; powder the residue, and add to the distilled spirit; digest a week and filter.

Juniper Berry Essence.—Dissolve ¾ oz. of oil of juniper in 3 pt. of rectified spirit, 90%. Filter.

Essence of Lemon.—Oil of lemon, acetic ether, and tartaric acid, each 10 parts; glycerine, 5 parts; aldehyde, 2 parts; chloroform, nitrous ether and succinic acid, each 1 part.

The different manufacturers of artificial fruit essences doubtless prepare them by formulæ of their own, and this explains the difference in the flavor, which is particularly noticeable on largely diluting them with water. If

the essences have been prepared with a dilute alcohol, their odor is more prominent and they are apparently stronger; but on mixing a small quantity with a large quantity of water in given proportions, the true flavoring strength may be better discerned.

A fruit essence which is much employed in the United States is essence of banana; it consists usually of butyric ether and amyl-acetic ether, equal parts, dissolved in about 5 parts of alcohol.

The red color of strawberry and raspberry essence is produced by aniline red (fuchsin), the bluish tint of which is conveniently neutralized by a little caramel. If caramel alone is used for coloriug essences a yellow or brown color is obtained, according to the quantity used.

Essence of Lemons.—From oil of lemon, as essence of almonds. For this purpose the oil should have been recently expressed and preserved from the air. A dash of essence of musk improves it as a perfume, but not as a flavoring essence. Oil of lemon is popularly called essence of lemons, as noticed elsewhere.

Lemon.—Oil of lemon, acetic ether and tartaric acid, each 10 parts; glycerine, 5 parts; aldehyde, 2 parts; chloroform, nitrous ether and succinic ether, each 1 part.

Lemon Peel.—1. One half lb. yellow peel of fresh lemons, ½ gal. boiling water; infuse one hour, express the liquor, boil down to ½ pt., cool and add ¼ oz. oil of lemon dissolved in 1½ pt. spirit of wine; mix and filter.

Melon Essence.—Take 7½ parts glycerine; 5 parts aldehyde; 4½ parts formiate of ethyl; 10 parts butyrate of ethyl; 12½ parts valerianate of ethyl; 25 parts sebacic ether.

Melon.—Sebacylic ether, 10 parts; valerianic ether, 5 parts; glycerine, 3 parts; butyric ether, 4 parts; aldehyde, 2 parts; formic ether, 1 part.

Mustard.—1. Mustard liniment of double strength [*not recommended*].

2. Whitehead's:

Black mustard seed, bruised.	2½ oz.
Tepid water	2 fluid oz.
Mix, and in a few hours add	
Oil of turpentine.....	1 pt.

Digest, with strong agitaiton, for 48 hours, then decant and filter. In the filtrate dissolve, by digestion and agitation, of—

Camphor (small).....	2 oz.
Oil of rosemary.....	3 drm.
Balsam of tolu.....	1 drm.
Annatto	½ drm.

Lastly, after repose, decant the clear portion.

Nectarine.—Extract of vanilla, 2 parts; essence of lemon, 2; essence of pineapple, 1.

Orange.—Oil of orange and glycerine, each 10 parts; aldehyde and chloroform, each 2 parts; acetic ether, 5 parts; benzoic ether, formic ether, butyric ether, amylacetic ether, methyl-salicylic ether and tartaric acid, each 1 part.

Orange Peel.—Four oz fresh yellow rind of orange, ½ pt. rectified spirit, ½ pt. water; digest for a week, press, filter; add 1 qt. sherry.

Peach.—Formic ether, valerianic ether, butyric ether, acetic ether, glycerine and oil of persico, each 5 parts; aldehyde and amylic alcohol, each 2 parts; sebacylic ether, 1 part.

Pear.—Acetic ether, 5 parts; amly-acetic ether and glycerine, each 2 parts.

Pennyroyal.—As peppermint.

Peppermint.—1. Oil of peppermint (Mitcham), 1 fluid ounce; rectified spirit, 1 pt.; mix by agitation. White. This is the usual strength of that solid in the shops. The corresponding preparation of the new Br. Ph., "spiritus menthæ piperitæ," has more than double this strength, being made with 1 fl. oz. of oil to 9 fl. oz. of rectified spirit.

2. To the product of No. 1 (above), add about half ounce of herb peppermint, parsley, leaves, spinach leaves, and digest for a week, or until sufficiently tinged; or agitate the essence with 10 or 12 grn. of sap green, previously rubbed down with about a teaspoonful of hot water. A delicate light green. The ignorant do not conceive it to be good and pure unless it has a pale greenish tint.

Used in toothache and to disguise foulness of the breath; but chiefly as a flavoring ingredient by confectioners, cooks and druggists. Peppermint (essence, water) is a great favorite in domestic and popular medicine, as a remedy in flatulence, colic, nausea, sickness, etc., and to disguise the flavor of nauseous substances. The dose of the essence is 10 to 30 drops on sugar, or mixed up with a little water or wine; of the water a teacupful or more, at will. A few drops of the essence well agitated with ½ pt. of cold water, form an extemporaneous peppermint water equal to that obtained by distillation. This water is an excellent mouth wash for smokers.

3. One oz. oil of peppermint, 4 oz. rectified spirit; mix.

4. To 3 add ½ oz. herb of peppermint, or parsley or spinach leaves (preferably one of the first two), digest for a week, or until sufficiently colored; 10 or 12 gr. sap green rubbed up with a teaspoonful of hot water, is also used for coloring.

5. Two fl. oz. of oil of peppermint, 16 fl. oz. rectified spirit.

Pineapple Punch Essence.—Alcohol, 2 qt.; rum, 1 qt.; artificial pineapple essence, ½ fl. drm.; essence œnanthic ether, 20 grn.; citric acid solution, 1 to 1½ fl. oz.; sirup, 2 qt.

Pineapple.—Amyl butyric ether, 10 parts; butyric ether, 5 parts; glycerine, 3 parts; aldehyde and chloroform, each 1 part.

Plums—Glycerine, 8 parts; acetic ether and aldehyde, each 5 parts; oil of persico, 4 parts; butyric ether, 2 parts; and formic ether, 1 part.

English Punch Essence.—1. Rum, 2 qt.; citric acid solution, 1 fluid oz.; essence of lemon, soluble, 1½ oz.; tincture vanilla, 1 fluid oz.; tincture cinnamon, 1½ drm.; alcohol, 95°, 1 to 2 pt. Add 2 qt. sirup. The alcohol may be left out.

2. Rum, 1 pt.; cognac, ½ pt.; citric acid solution, ½ to 1 oz.; essence of lemon, soluble, 15 grn.; sirup, 1 pt.; mix.

Quassia.—1. Digest 1½ oz. sliced quassia in 1 pt. proof spirit for ten days, and filter.

Raspberry.—Acetic ether and tartaric acid, each 5 parts; glycerine, 4 parts; aldehyde, formic ether, benzoic ether, butyric ether, amyl butyric ether, acetic ether, œnanthic ether, methyl salicylic ether, nitrous ether, sebacylic ether, and succinic acid, each 1 part.

Rennet—One clean fresh rennet minced; salt, 4 oz.; glycerine, 2 oz.; 4 oz. alcohol; sirupy lactic acid, 1 drm.; water, 20 fluid oz.; digest seven days, shake frequently, filter; color with cochineal; add 10 minims of chloroform, add enough water to make 40 fluid oz.

Rhubarb.—Five oz. rhubarb powder; 5 oz. silicious sand; 1 pt. proof spirit; extract by displacement.

Sarsaparilla.—1. Two and three-quarters lb. sarsaparilla root (best red Jamaica), carefully decorticated; the bark reduced to coarse powder, and digested for seven to ten days in ¾ pt. sherry and ¼ pt. rectified spirit, with frequent agitation; the essence is expressed, and in a week the clear portion is decanted from the sediment.

2. Seven oz. alcoholic extract of sarsaparilla; ¾ pt. sherry; ¼ pt. rectified spirit; dissolve and filter.

3. Four oz. alcoholic extract, 1 pt. sherry; dissolve and filter.

4. Four oz. alcoholic extract, 1 lb. white wine.

5. Ten oz. bruised sarsaparilla; 6 pt. distilled water; macerated at a temperature of 120° F. (49° C.) for six hours, and strain; repeat with the same quantity of fresh water; mix the li-

quors and evaporate in china vessels at 160° F. (71 C.).

6. Two and three-quarters lb. bark separated from sarsaparilla root, exhausted with water as 5; the liquid is evaporated as quickly as possible in a water bath to 16 fluid oz., and when cold mixed with 4 fluid oz. rectified spirit.

Savory Spices.—1. Four oz. black pepper; 3 drm. powdered turmeric; 1½ drm. coriander seeds (all ground), 1½ fluid drm. oil of pimento, ½ drm. each oils of nutmeg, cloves, cassia, and caraway; 1 pt. rectified spirit; digest with agitation for a fortnight.

Soap.—Four oz. Castile soap (in shavings); 1 pt. proof spirt; dissolve and add a litte perfume.

Essence of Soup Herbs (Kitchener).—Lemon thyme, 1½ oz.; winter savory, 1½ oz.; sweet marjoram and sweet basil, each 1½ oz.; grated lemon peal, ¾ oz.; eschalots, ¾ oz.; bruised celery seed, ⅜ oz.; proof spirit, 1½ pt. Digest from ten to fourteen days. A good flavoring essence for soups, gravies, etc.

Strawberry.—Butyric ether and acetic ether, each 5 parts; amyl-acetic ether, 3 parts; amyl-butyric ether and glycerine, each 2 parts; formic ether, nitrous ether and methyl-salicylic ether, each 1 part.

Tonic Beer Essence.—Oil of wintergreen, 6 drm.; oil of sassafras and oil of orange, of each 6 drm.; oil of anise, 30 grn.; oil of cloves, 30 grn. Cut the oils, dissolve in 20 fl. oz. alcohol 95°; add gradually 20 fl. oz. water.

Vanilla.—1. Take—

Vanilla	2 oz.
Rectified spirit	1 pt.

Digest for a fortnight.

2. Vanilla (finest) ½ lb.
Rectified spirit 1 qt.

Proceed as last, or, preferably, as for essence of musk. Lastly, press and decant or filter. Very superior. It forms the best quality vended by the wholesale druggists, and is sold at exorbitant prices. This, as well as the preceding, is chiefly used for flavoring and as an ingredient in compound perfumes and cosmetics.

Volatile Essence, Volatile Ammoniacal Essence, Essentia Volatilis, Essentia Volatilis Aromatica, etc.—This is the strongest liquor of ammonia appropriately scented or aromatized. Nearly every maker has his own formula. The products of the following, which are given as examples, are highly esteemed in fashionable life:

1. Otto of roses	12 drops.
Oil of cinnamon	½ fl. drm.
Oil of cloves	1 fl. drm.
Oil of bergamot	2 fl. drm.
Oil of lavender (Mitcham)	4 fl. drm.
Essence of musk	5 fl. drm.
Liquor of ammonia (sp. gr. 0·882-0·880)	1 pt.

Put them into a 1½ pt. bottle and shake it well until they are combined, observing to do so also each time before use. The bottle should be kept in a cold place.

2. Oil of lemon	5 fl. drm.
Oil of bergamot	5 fl. drm.
Oil of lavender (Mitcham)	2 fl. drm.
Oil of cloves	1 fl. drm.
Otto of roses	1 fl. drm.
Oil of cassia	½ drm.
Oil of cedrat	½ drm.
Neroli	½ drm.
Oil of sandalwood	15 drops.
Liquor of ammonia (see above)	1 pt.

As before.

3. Oil of bergamot	3 fl. drm.
Oil of lavender (Mitcham)	2 fl. drm.
Oil of cloves	1½ fl. drm.
Oil of cassia	¾ fl. drm.
Oil of verbena	¾ fl. drm.
Oil of rhodium	½ fl. drm.
Oil of sandalwood	½ fl. drm.
Liquor of ammonia (see above)	½ pt.

As before.

4. Oil of bergamot	3 drm.
Oil of lemon	2 drm.
Oil of lavender	1 drm.
Oil of jasmine	1 drm.
Oil of sassafras	½ drm.
Neroli	15 drops.
Otto of roses	15 drops.
Oil of origanum	15 drops.

Etching.—The following is a simple description of the process of etching: For copper plates two preparations are required. 1. The mordant, composed of hydrochloric acid, 100 grm.; chlorate of potash, 20 grm.; water, 880 grm. The water is to be warmed and the chlorate of potash perfectly dissolved in it first; then the acid is added; the common muriatic acid of commerce must not be used; it gives off intolerable fumes and is of a deep yellow color. The proper form of the acid for etching does not fume, and has a very slight odor when mixed with water.

2. The ground for the copper plate, consisting of a solution of yellow beeswax in turpentine, decanted until no sediment remains; the solution should be clear and of a bright yellow color; add ⅛ of its volume of Japan varnish. To prepare the plate, clean the surface with engraver's emery paper, then pour a small quantity of the mordant into a shallow porcelain bath, such as photographers use, and put the plate in the bath, leaving it until the surface darkens all over; if any spots remain bright it is a sign that the plate is greasy, in which case the grease must be removed; then, when the plate is uniformly dark, wash and dry it and pour on a little of the ground, so that it covers the surface all over, let it dry for twelve hours, then apply a second coat of ground, and without waiting for it to dry smoke the surface with twisted tapers, holding the plate upside down; let it dry and the plate will be ready for etching on. Etching needles can be made of ordinary sewing needles with points of different sharpness, set in wooden handles. A more satisfactory kind, however, consists of a bar of steel about the thickness of one's little finger in the middle, tapering to a point at each end; these needles are more easy to work with, as the weight of the needle, or rather bar, is enough to penetrate the wax coating on the plate, and the hand is left at liberty to draw freely; the needle can be sharpened on a sharpening stone. Now proceed to draw on the plate, taking care that the needle goes through the wax and touches the plate; take care also that your nail does not remove the ground, or there will be a line where you do not want one. It is a good plan to have a piece of board with a hollow about one-fourth of an inch deep sunk in it of slightly larger dimensions than the copper. Place the plate in this, and have a flat piece of wood like a drawing ruler, which you can place across the hollow, so that you can etch any part of the plate without fear of damaging the ground. Draw all the darkest lines first; then immerse the plate in the bath containing the mordant for three hours. Take it out, dry it with blotting paper, taking care not to push the wax back into the lines you have drawn; draw the next darkest lines, put the plate in the bath for one and a half hour, dry it again, draw the lighter lines, put it in the bath for three-quarters of an hour, dry again and draw the lightest lines, and put in bath for three-quarters of an hour. The lines will then have bitten for six hours, four and a half hours, one and a half hour and three-quarters of an hour, according to the darkness you wish to produce. Six hours is about the average time for this biting solution; but it requires a longer time in winter and shorter in summer. The ground must now be re-

moved with petroleum, and a proof of the plate must be taken to see if there is anything further required. The etching is much improved by being touched up with a sharp point, filling up gaps you may have left and making the shades blend better; this is done without acid, of course, and is more in the style of engraving; it is termed dry point. Unless you have some experience in copperplate printing send the plate to a regular lithographer, as it will be a long time before you can print properly.—Correspondent in *English Mechanic*.

Alabaster, to Etch.—Use a ground of white wax and oil of turpentine, ¼, thickened with very finely powdered white lead, and etch with very dilute acetic or hydrochloric acid.

Brass, Etching on.—1. Sixteen parts nitric acid (s. g. 1·40), add to 160 parts water; dissolve 6 pt. potassium chlorate in 100 of water. Mix the two solutions.

2. Many of the etching receipts for copper apply here; Nos. 1, 2, 3 particularly.

3. For surface printing on brass in the lithographic manner, Roret's Manual gives:

Gum arabic	8 parts.
Nutgalls	2 parts.
Nitric acid	1 part.
Phosphoric acid	4 parts.
Water	30 parts.

Bronze, Etching on.—For etching bronze, the following is given in Roret's "Manuel du Graveur:"

Pure nitric acid at 40°	100 parts.
Muriatic acid at 20°	5 parts.

Also try any of the copper etching formulas.

Copper Etching.—1. (Lalanne.) Nitric acid, 40°, mixed with equal amount of water, add pieces of scrap copper.

2. Nitric or sulphuric acid, 1 part; potassium bichromate saturated solution, 2 parts; water, 5 parts.

3. (Dutch Mordant.) Hydrochloric acid (fuming s. g. 1·190), 10 parts; water, 70 parts; then add boiling solution potassium chlorate; dilute.

4. (Roret's.) Distilled vinegar, 1 l.; ammonium chloride, 60 grm.; sodium chloride, 60 grm.; pure verdigris, 40 grm. Grind up the solids and boil in the vinegar. Acetic acid (at 3°) may be used in place of vinegar.

5. Relief Etching.—Nitrous acid (30°), 1 oz.; silver acetate, 3 drm.; nitric ether (hydrated), 8 oz. To prepare nitric ether mix 1 oz. alcohol, 1 oz. nitric acid and stop reaction by adding 4 oz. pure water.

6. Tint Etching (Roret's).—Bay salt, 2 parts; ammonium chloride, 1 part; verdigris, 1 part. Grind up with old honey (sirup).

7. Fielding.—Nitrous acid, 1 part; water, 5 parts. Used for aquatints.

8. Callot and Piranesi.—Strong vinegar, 8 parts; verdigris, 4 parts; ammonium chloride, 4 parts; salt, 4 parts; alum, 1 part; water, 16 parts.

Etching Brass Signs.—Paint the sign with asphalt varnish, leaving the parts to be etched unpainted, raise a border around the outside, made of soft beeswax or asphalt, to hold the acid. Use nitric acid diluted with five times the quantity of water. Pour the dilute acid on to the sign about ¼ in. deep. When the letters are cut deep enough, which must be found by trial, the acid may be poured off and the plate cleaned by heating and wiping, and finally with turpentine.

Etching on Cutlery.—1. For etching on cutlery a ground wax is required, composed of equal parts asphaltum, Burgundy pitch and beeswax, melted together and thoroughly incorporated. In applying it, use a dabber, or ball of cotton covered with silk. Warm the piece of cutlery so that a stick of the wax will readily melt by touching. Smear a small quantity of the wax on the blade or articles, and dab it evenly all over the surface. When cold, scratch the required design or name on the surface and touch the parts with acid (nitric acid 1 part, water 4 to 6 parts), using a camel's hair pencil to cover the surface and bring the acid into contact with all the lines. In a few minutes the biting is done. Dip in hot water to wash off the acid, and the surface may be cleaned by wiping with benzine. Another way is to make a varnish of asphalt and turpentine, with a few drops of linseed oil to make it tacky. Have a rubber stamp made of the required design, with a border, so as to stop off around the design. Stamp the goods, and with some of the varnish thinned down with turpentine and a brush stop off the surrounding parts; or surround the design with a small rim of beeswax, and apply the acid as above.

2. For etching brands and marks on polished steel surfaces, such as saws, knife blades, and tools, where there are many pieces to be done alike, procure a rubber stamp with the required design made so that the letters and figure that are to be bitten by the acid shall be depressed in the stamp. Have a plain border around the design, large enough to allow a little border of common putty to be laid around the edge of the stamped design to receive the acid. For ink, use resin, lard, oil, turpentine and lampblack. To ¼ lb. of resin put 1 teaspoonful lard oil; melt, and stir in a tablespoonful of lampblack; thoroughly mix, and add enough turpentine to make it of the consistency of printer's ink when cold. Use this on the stamp in the same manner as when stamping with ink. When the plate is stamped, place a little border of common putty around and on the edge of the stamped ground. Then pour within the border enough acid mixture to cover the figure, and let it stand a few moments, according to the depth required, then pour the acid off. Rinse the surface with clean water; take off the putty border, and clean off the ink with turpentine. Use care not to spill the acid over the polished part of the article. For the acid, 1 part nitric acid, 1 part hydrochloric acid, to 10 parts water by measure. If the effervescence seems too active, add more water.

Glass, Liquid for Etching on.—1. This preparation may be made by mixing sulphate of barium and fluoride of ammonium in the proportion of three parts of the former to one part of the latter, with sufficient sulphuric acid to decompose the ammonium, and bring the mixture to the consistency of rich milk. The mixture should be made in a receptacle of lead, and kept in a bottle of the same material, or of gutta percha.

2. Since fluoric preparations have been produced at reasonable prices the decoration of glass by their means has steadily made its way. Etched glass is now to be found everywhere, and glass etching runs glass cutting very hard. It is very easy to understand that well etched objects appear actually more beautiful than those which have been cut. The cost of production is cheaper, and since M. Hock, a Viennese chemist, has given us an elaborate work upon the technics of glass etching, the difficulties attending this kind of work have been reduced to a minimum.

As is well known, fluoric acid usually etches smooth, while other fluoric preparations yield a matt surface. The most beautiful ornamentation is obtained when certain parts of the glass surface are rendered matt by means of fluoride of ammonium which has been slightly acidified by means of acetic acid. The matt appearance is not always the same with different kinds of glass, but varies much in beauty; this effect is governed by the composition of the glass, lead glasses being easily acted upon and furnishing a very fine matt surface.

3. Where it is desired to have the surface of the glass not altogether matt, but shining like ice, as in the case of window glass, this may be attained in a simple manner by placing the

glass plate in a perfectly horizontal position and covering it with fine groats. Then very dilute fluoric acid is poured upon it. The groats act as a shield and produce upon the glass raised points.

4. Several ways exist of etching photographs on glass. A good result may be secured by covering the surface with a solution of gum made sensitive with bichromate of potash, and printing the same under a negative; after the image has been thus produced it is dusted over with minium or red lead, and the red picture thus obtained is fixed and burnt in in the usual manner. The easily soluble red glass so obtained is treated with strong sulphuric acid, when a white matt design is produced, and the picture appears by transmitted light as a positive.—*Photographisches Archiv.*

Etching Film for Tracing with a Needle.—Mr. H. Trueman Wood sends the following to the *Photographic News:* There are many purposes in photography for which an opaque film capable of being etched with a sharp point might be useful. Such a film can be obtained by use of the following formula: Negative collodion, ½ oz.; ether, 6 drm.; alcohol, 6 drm.; shellac, 30 grn.; aurine, 2 grn.; Judson's mauve dye, 30 drops; water, 30 drops.

Grounds for Etching.—1. White wax, 30 parts; gum mastic, 30 parts; asphaltum. 15 parts.

2. White wax, 30 parts; gum mastic, 15 parts; asphaltum, 15 parts.

3. White wax, 60 parts; gum mastic, 30 parts; asphaltum, 60 parts.

4. White wax, 3 parts; block pitch, 1 part; asphaltum, 4 parts; rosin, 1 part.

5. Callot's ground linseed oil varnish and mastic; heat until the wax is melted, filter, apply with brush and heat plate until varnish stops smoking.

6. White wax, 2 oz.; black and Burgundy pitch, of each ½ oz.: melt together; add by degrees powdered asphaltum 2 oz., and boil till a drop taken out on a plate will break when cold by being bent double two or three times, pour into warm water and make into small balls.

7. Soft.—Soft linseed oil, 4 oz.; gum benzoin and white wax, of each ½ oz.; boil to two-thirds.

Iron, etching on. See *Steel* below.

Ivory, Etching on.—Use dilute sulphuric and hydrochloric acids mixed.

Silver, to Etch on.—Proceed as for copper or brass, but great care must be used in preparing a proper ground and in stopping out.

Steel, to Etch on.—1. Two oz. copper sulphate; alum, ½ oz., salt, ½ oz., mixed with ½ pt. vinegar, and 40 drops nitric acid can be used for frosting the steel.

2. Glacial acetic acid, 4 parts; absolute alcohol, 1 part; nitric acid, (s. g. 1·28), 1 part; allow the acetic acid and alcohol to remain for half hour, then add nitric acid carefully. Etch from one to fifteen minutes.

3. Alcohol, 3 parts; water (distilled), 5 parts; nitric acid, 8 parts; silver nitrate, 8 parts. Wash the plate with very dilute nitrate acid, then apply the solution for three minutes, and wash with 6% solution of alcohol. Repeat if necessary.

4. (Deleschamp's for vertical bite). Silver acetate, 2 parts; rectified spirits, 125 parts; distilled water, 125 parts; nitric acid, 65 parts; nitric ether (see No. 5 of copper etching above), 16 parts, oxalic acid, 1 part.

5. Iodine, 4 parts; potassium iodide, 10 parts; water, 80 parts. This is very highly recommended.

6. No. 3 of copper etching above.

7. (Roret's). Nitric acid, 62 parts; water 125 parts; alcohol, 187 parts; copper nitrate, 8 parts.

8. Cover the surface with a thin coat of asphaltum varnish of fine quality, then cut the design through to the surface of the steel, and etch with a weak solution of nitric acid in water; finally wash with hot water and remove the ashphaltum with hot turpentine.

9. For steel—iodine, 1½ oz.; iron filings, ¾ drm.; water, 6 oz. Digest until the iron is dissolved. For fine touches take 6 parts each verdigris, sea salt and sal ammoniac; dissolve in 12 parts vinegar, add 24 parts water, boil a minute and allow to cool.

10. Clean the steel and cover evenly with wax, cut the lines with steel point through the wax and pour on the following etching fluid: Pyroligneous acid, 4 oz.; alcohol, 1 oz.; nitric acid, 1 oz., by measure. Or use iodine, 1 oz.; iron filings, ½ drm.; water, 4 oz. Etching fluid is removed as soon as the metal is sufficiently etched.

Zincographic Etching.—1. The solution most commonly employed for this purpose in use at the Ordnance Survey Office, Southampton, and given by Sir Henry James in his work on *Photozincography*, is as follows: 4 oz. Aleppo galls are bruised and steeped in 3 qt. of cold water for twenty-four hours; the water and galls are then boiled up together and the decoction strained. The gum water should be about the consistency of cream. 1 qt. of the decoction of galls is added to 3 qt. of the gum water, and to the mixture is added abont 3 oz. of phosphoric acid, which is prepared by placing sticks of phosphorous in a loosely corked bottle of water, so that the ends of the sticks may be uncovered. The oxidation of the phosphorous produces phosphoric acid, which dissolves as fast as it formed.

The etching solution should only just mark a piece of plain zinc.

2. In Richmond's "Grammar of Lithography" the following modifications of this formula are given:

Decoction of nutgalls	¾ pt.
Gum water as thick as cream	¼ pt.
Phosporic acid solution	3 drm.

Boil 1¼ oz. of bruised nutgalls in 1¼ lb. of water till reduced to one-third, strain and add 2 drm. of nitric and 4 drops of acetic acid.

3. Husnik gives the following, also used by Hannot at the Depot de la Guerre, Brussels:

Gum arabic	40 parts
Sulphate of copper	2 parts
Gallic acid	5 parts
Nitric acid	½ part
Water	1,000 parts

4. Motteroz uses gum water acidulated with a few drops of muriatic acid, so that it will not visibly bite the plate, or better, decoction of nutgalls.

5. Moock gives:

Water	100 gr.
Gum arabic	15 gr.
Nitric acid	2 drops
or muriatic acid	4 to 5 drops
Solution of nutgalls	10 gr.

6. Scamoni has the following, by Garnier: Boil about 1¼ oz. of bruised gallnuts in a pint of water till reduced to ⅛, filter and add 2 drops of nitric acid and 3 to 4 drops of muriatic acid. For very fine work this may be weakened with water. It is applied for about a minute, then washed off and the plate gummed.

Zincotypographic Etching.—In biting zinc plates in relief, the acid generally used is nitric, of different degrees of strength, according to the nature and state of the work.

7. Kruger, in his *Die Zinkogravure*, recommends for the first relief etching, nitric acid 30 to 40 drops to 100 grm. of water, applied for five minutes. For each subsequent etching 8 to 10 drops of acid are added for each 100 grm. of water, and the time is increased by degrees

from five to fifteen minutes. For the final etching of the broad lights he uses:

Muriatic acid	4 parts.
Nitric acid	1 part.
Water	16 parts.

To soften down the ridges between the lines the plate is inked and dusted as before, and etched with dilute nitric acid at 5% applied for about a minute, and the inking, dusting and etching repeated as often as may be necessary.

8. According to Husnik, the first two bitings are given with 1 part of nitric acid to 40 of water, the first biting lasting two minutes, the second four to five minutes. For the third biting the acid is used double the strength, and applied for five minutes. The acid is made stronger for each successive biting.

9. Moock ("Impression Photographique aux Encres Grasses") gives a first biting with nitric acid at 2% for two or three minutes, adding about the same quantity of acid for five successive bitings, gradually increasing the time. After the first five bitings the plate is thoroughly cleaned, strongly heated, well inked again with a harder ink, and rebitten with acid as strong as the last used; the operation is repeated for four more bitings, using less heat, and biting less and less each time. These last bitings are for smoothing off the edges of the lines.

10. In his "Instruction in Photography" Captain Abney gives the following process:

Having made the transfer in the usual way, and dusted it with resin, flood the surface of the zinc plate with a 10-grn. solution of sulphate of copper, which precipitates copper on the uncovered parts, and forms a copper-zinc couple. It can then be etched with very dilute acid.

Hydrochloric acid	1 part.
Water	500 to 750 parts.

This is contained in a rocking trough kept constantly in motion. The first etching takes about twenty minutes. The plate is then washed and inked, dusted and coppered again, and then etched with acid twice as strong, the operation being repeated as often as may be necessary.

11. Deep Etching.—For simple etching on zinc, Seymour Haden recommends 1 part nitric acid to three of water; or,

Hydrochloric acid	10 parts.
Chlorate of potash	2 parts.
Water	88 parts.

Dissolve the chlorate of potash in half the water (boiling), and mix the hydrochloric acid with the remainder. The two solutions are added together for use.

12. Kochler ("Lalanne's Etching") says 1 part of nitric acid to 8 parts of water is equal in effect to equal parts of acid and water used with copper for the same length of time.

13. A. Martin uses 1 part nitric acid to 2 of water.

14. Kruger ("*Die Zinkogravure*") gives:

Sulphate of copper	2 parts.
Chloride of copper	3 parts.
Water	64 parts.
Muriatic acid	8 parts.

also

Nitric acid	1 part.
Water	40 parts.

15. M. Gourdon has proposed a curious process of photo-engraving on zinc, founded on M. Merget's discovery that if zinc be covered by precipitation with certain metals, it is only bitten by nitric acid in the parts left uncovered, while, on the contrary, dilute sulphuric, muriatic, acetic, and other acids will bite it only in the parts covered by the other metal. Thus, if zinc is covered in parts, as by writing, with a thin coat of powdery platinum, the parts covered with the platinum may be etched with sulphuric acid diluted with 7,000 parts of water. If gold be substituted for platinum, sulphuric acid diluted with 5,000 parts of water will etch it. Silver requires 3,500 parts water; tin, 1,500; antimony, 700; bismuth, 500; lead, 400.

Etching Varnishes. See **Varnishes.**

Ether.—To find the percentage of ether in a mixture of ether and alcohol. By finding the specific gravity at 60° F. of a mixture of ether and alcohol, the following table will give the percentage of absolute ether contained in the mixture.

Spec. Grav.	Per Cent.	Spec. Grav.	Per Cent.
0·7198	100	0·7673	65
0·7246	95	0·7636	60
0·7293	90	0·7701	55
0·7343	85	0·7772	50
0·7397	80	0·7840	45
0·7455	75	0·7880	40
0·7514	70	.....	..

Eukesis. See **Soaps.**

Evaporation.—*Syn.* Evaporatio (*Lat.*). Evaporation (*Fr.*). Abdunsten, Abdampfen, (*Ger.*).—1. The dissipation of a fluid by means of heat. In chemistry and pharmacy evaporation is had recourse to, either for the purpose of recovering a solid body from its solution, as in the preparation of extracts, chemicals, salts, etc., or to strengthen a solution by the expulsion of some of the fluid matter that forms the menstruum. Evaporation is also employed, though less frequently, to purify liquids, by dissipating the volatile matters which may contaminate them. Under ordinary circumstances, evaporation is confined to the surface of the heated liquid, and is therefore slower or quicker in proportion to the extension of that surface. Hence has arisen the adoption of wide shallow vessels for containing fluids during their exposure to heat for this purpose.

It has been found that evaporation proceeds most rapidly when a current of air is made to pass over the surface of the fluid, as, in this case, the vapor is prevented resting upon the surface, and impeding the process by its pressure. On the small scale, shallow capsules of glass, wedgwoodware, porcelain or metal, are commonly employed as evaporating vessels, and these are exposed to heat by placing them over a lamp, or naked fire, or in a water bath, or sand bath, according to the temperature at which it is proper to conduct the process. On the large scale, high pressure steam is usually employed as the source of the heat. The term spontaneous evaporation is applied to the dissipation of a fluid by mere exposure in open vessels, at the common temperature of the atmosphere, and without the application of artificial heat. The celerity of this species of evaporation wholly depends on the degree of humidity of the surrounding air, and differs from the former, in which the rate of evaporation is proportionate to the degree of heat at which the process is conducted, and the amount of pressure upon the surface of the liquid. Evaporation *in vacuo* (as it is called) is conducted under the receiver of an air pump, or in an attenuated atmosphere, produced by filling a vessel with steam, by which means the air is expelled, when all communication with the external atmosphere is cut off, and the vapor condensed by the application of cold. Fluids are also evaporated in air tight receivers over sulphuric acid, by which they are continually exposed to the action of a very dry atmosphere. When such a receiver is connected with an air pump in action, evaporation proceeds with increased rapidity, and intense cold is produced.—*Cooley.*

2. The object of this may be to separate volatile liquids from others less so; to concentrate or strengthen solutions by getting rid of a portion of the liquid they contain —condense them; to restore substances to their solid condition; to promote crystallization, etc. The vessels used for this process should be broad and shallow, in order to expose a large surface of their contents, and it is facilitated by heat, currents of air, dryness of the atmosphere, etc. If the process can be conducted in pans which are covered, or in vacuum pans where the pressure of the atmosphere can be removed, the substance will evaporate more rapidly. On a small scale evaporation can be carried on in porcelain evaporing dishes, and using an alcohol lamp or Bunsen burner. Place a piece of wire gauze under the dish.

Excoriation.—*Syn.* Excoriatio, (from excorio, to flay, or to cut off the skin.) An abrasion.—Young children are very apt to be chafed under the arms, behind the ears, between the thighs, and in the wrinkles and folds of the skin, unless great attention is paid to cleanliness, and wiping the skin perfectly dry after washing. Whenever there is a tendency to excoriations of this kind, either in adults or children, a little finely powdered starch, or violet powder, applied by means of a puff, or a small bag of muslin, once or twice a day, will generally remove them, and prevent their occurrence in future. Mild unguents, as cold cream, or spermaceti cerate or ointment, may also be used with advantage. The preference should, however, be given to the former remedies from their not soiling the linen. Excoriations arising from the removal of the skin by friction or external violence, have already been noticed under the head abrasion.

Expectorants.—Medicines that promote the secretion of the tracheal and bronchial mucus.

Expression.—Is required to separate the last portions of tinctures, infusions, etc.; also the juices of fresh plants, fruits, etc., after being properly crushed. A screw press is best for this purpose, but strong bags, and various other means may be made use of.

Extinguishing Compounds. See **Fire.**

Extracts. See **Perfumes.**

Extracts. See **Soaps.**

Extracts.—Different fluids, acetic, alcoholic and ethereal, are used as solvents in the preparation of extracts, as may be best adapted to the solubility of the substance from which the extract is being prepared; and the solution is effected by either maceration, percolation, infusion or decoction, as circumstances require. The solution thus obtained is poured off, and the remaining soluble matter either pressed or washed out and added to the solution; it is next allowed time to settle, then decanted and strained or filtered, and if this fails to render the liquid clear it is clarified by white of egg and filtered, Canton flannel, first soaked in water, being generally employed for this purpose. When water acidulated with acetic acid is employed, vegetable substances are usually macerated in it, or the dilute acid is sprinkled over the bruised plant, if fresh, and the juice expressed by strong pressure. The solution thus obtained, or the juice when obtained by expression from fresh substances, is then evaporated by rapid boiling until thick enough to cause some risk of burning, when it must be completed either by a bath or by the slower process of exposure in an evaporating dish, heated air, etc., to a proper consistence.

Extracts, Fluid.—This form of preparations was introduced into the United States Pharmacopœia for the first time in 1850 as a distinct class of preparations. Their distinctive character is the concentration of the active ingredients of a substance into a small bulk and in liquid form. Their advantages consist in greater convenience of administration, and in the fact that, from the less degree of evaporation to which they have been subjected, the active principles they contain are less liable to have suffered injury by heat. The main difficulty lies in their liability to undergo spontaneous decomposition. This is counteracted in some cases by the addition of sugar, in others by alcohol, and in others again by a mixture of both. Some fluid extracts when combined with sugar have a tendency to precipitation, rendering them turbid or cloudy in appearance. To obviate this Mr. Alfred B. Taylor has proposed the use of glycerine, which, while it has the same preservative influence, possesses the property of dissolving the matter which would be deposited by the use of sugar. The solutions for preparing them are obtained by percolation, and the menstruum used is alcohol or alcohol and water, the proportions of each depending on the nature of the substance to be extracted.

Cherry.—Oil of bitter almonds, 2 drm.; apple oil, 1 oz.; citric acid, 1 oz.; alcohol, 70°, 2 pt.

Cinchona.—16 oz. yellow cinchona bark in coarse powder, sufficient distilled water, 1 oz. rectified spirit; macerate the bark in 40 oz. water for twenty-four hours, pack in a percolator and add water until 240 oz. have passed through, or until the bark is exhausted; evaporate the liquor to 20 oz. at a temperature not exceeding 160° F. (71° C.); filter and continue the evaporation to 3 oz., or until the sp. gr. of the liquid is 1·200; when cold add the spirit gradually, constantly stirring.

Cocoa.—Dissolve 1 lb. of chocolate in a qt. of boiling water, let it cool; take out the cocoa butter and add to it 4 oz. of glycerine and bottle. For flavoring ice cream.

Compound Coffee, Extracts, (for Dispensing).—1. Ground Java coffee, 8 oz.; sliced vanilla bean, 2 drm.; diluted alcohol, q. s.

2. Ground roasted coffee, 2 to 8 oz.; cinnamon, bruised, 60 grn.; vanilla, sliced, 60 grn.; diluted alcohol, q. s. Moisten the ingredients with some of the liquid and pack in percolator. Put in enough diluted alcohol to leave a stratum above it. Macerate for forty-eight hours, covered; percolate, pour on enough diluted alcohol until 32 fluid oz. of extract is obtained.

Coffee, Extracts, Plain. For Dispensing (Liebig's).—Pour 1 qt. boiling water on 2 lb. of best ground coffee; allow it to stand one hour, place in a percolator; add enough water to obtain 32 fluid oz. of extract; add 2 oz. of alcohol to preserve, or more alcohol if intended to keep a long time.

Coffee.—Pour upon a pound of the best fresh roasted coffee 1 qt. of cold water, heat gently for half hour, then let it come to a boil, cool for two hours, strain and add 4 oz. of glycerine.

Ergot.—Sixteen oz. ergot in coarse powder, 20 oz. ether, 70 oz. distilled water, 8 oz. rectified spirit. Shake the ether in a bottle with half its bulk of the water, and after separation decant the ether. Place the ergot in a percolator, and free it from oil by passing the washed ether through it; remove the marc and digest it in the remainder of the water for twelve hours at 160° F. (71° C.). Press out the liquor and evaporate it to 9 oz., and when cold add the 8 oz. spirit; allow it to stand for an hour to coagulate; filter, and make up the quantity to 16 oz.

Foam Extract.—Crushed soap bark, ½ lb.; alcohol, ½ pt.; glycerine, ½ pt.; water, 1 pt. The bark should be saturated with 3 oz. of the mixture of alcohol, glycerine and water. Pack in a percolator, close the lower orifice; add enough liquid to leave a stratum above the bark; then macerate for twenty-four hours, and percolate; add of alcohol, glycerine and water in the above proportions enough to obtain 1 qt. of extract.

The proportions are from 1 drm. to ½ oz. to 2 qts. of sirup, according to the foam desired on the beverage.

Ginger Extract.—For extract of ginger proceed as follows: Take of ginger in No. 40 powder 50 oz. avoirdupois, alcohol enough to make 3 pt. Pack in a percolator, first moistening with 14 fluid oz. alcohol. Add enough alcohol to leave a stratum above the powder. When it begins to percolate close the lower orifice, cover the top of the percolator closely, and let it stand for forty-eight hours. Then open and allow to percolate until exhausted. Reserve the first 43 fluid oz. of the percolate. Evaporate the remainder to a soft paste, dissolve this in the reserved portion, and add enough alcohol to make the fluid extract measure 3 pt. The dose is from 10 to 20 minims.

Ginger, for Dispensing (Creuse's Process).—Fluid extract of ginger, 1½ pt.; water, 3 pts.; carbonate of magnesia, 3 oz. Mix, shake often for twenty-four hours, filter, evaporate to ¾ pint and add ¾ pt. alcohol.

Ginger Ale Extract.—Soluble essence of ginger, 1½ pt.; essence of lemon, soluble, 1½ oz.; essence of ginger oil, soluble, 1½ oz.; extract of vanilla, soluble, 1½ oz.; soluble essence rose oil, ¾ oz.; tincture cinnamon, soluble, 1½ drm.; artificial essence pineapple, ¾ drm.; essence capsicum, 3 drm.; mix.

Malt.—1. An infusion of malt is made in water at 160° to 170° F. (71° to 77° C.), drained off without pressure, and evaporated to a honeylike consistence. The quantities are—1 pt. crushed malt in 3 pt. hot water, and the infusion occupies about four hours.

2. 47½ oz. extract of malt, mixed with 1 oz. iron pyrophosphate and ammonia citrate dissolved in 1½ oz. water.

3. Six oz. coltsfoot leaves, 6 oz. spotted lungwort, 8 oz. licorice, 2 lb. stoned raisins, 6 gal. old strong ale, not hopped; boil down to 4 gal., express strongly, and evaporate to honeylike consistence.

Mead.—Oil of lemon, 1 oz.; oil of cloves, 2 drm.; oil of cinnamon, 2 drm.; oil of nutmeg, 1 drm.; oil of allspice, 30 drops; oil of sassafras, 40 drops; oil of ginger, 1 drm. Cut the oils with pumice and sugar; dissolve 16 or 32 oz. alcohol. Add gradually an equal quantity of water. Clarify.

Meat.—One oz. lean meat, recently killed, chopped very small; 8 oz. cold water; shake well together for ten minutes; heat gradually to boiling; let simmer gently for a few minutes; strain through a hair sieve while still hot; evaporate to a soft mass. One lb. meat yields barely 1 oz.—*Liebig.*

Myrrh.—Compound.—2 oz. myrrh, 2 drm. gum arabic powder; triturate, add water enough to form a thick emulsion and 4 oz. extract of couch grass.

Opium.—1. One lb. opium in thin slices, 6 pt. distilled water; macerate the opium in 2 pt. of the water for twenty-four hours; express the liquor. Reduce the residual opium to a uniform pulp, macerate again in 2 pt. of the water for twenty-four hours; express; repeat the operation a third time; mix the liquors, strain through flannel and evaporate by a water bath to pilular consistence.

2. One and a half lb. powdered opium, 2½ pt. cold distilled water; mix gradually; macerate for twenty-four hours, frequently stirring with a spatula; press, strain and repeat the maceration for twenty-four hours with a fresh 2½ pt. water; evaporate the mixed strained liquors to a proper consistence.

3. Sixteen oz. distilled water, 4 oz. rectified spirit: digest the extract of opium in the water for an hour, stirring frequently; filter; add the spirit.

4. One oz. opium, 1 qt. distilled vinegar; digest two days with heat; decant, filter, evaporate.

5. Four oz. aqueous extract, 1 oz. resin; beat well together; add 16 oz. boiling water; boil to one-half; add 8 oz. cold water, filter, evaporate.

6. Four oz. opium, 4 oz. sugar, 1 qt. water; rub together and keep the mixture loosely covered in a warm situation, about 70° F. (21° C.), for ten days or more; add 1 qt. cold water; next day filter and evaporate.

7. One oz. unstrained mixture of opium, 8 oz. water and a little yeast; leave for a week at a temperature of 68° to 77° F. (20° to 25° C.); dilute, filter and evaporate.

Fluid Extract of Orange Peel.—Mr. M. Bond, in the *Journal of Pharmacy*, describes an improved method of preparing this extract. The process, concisely stated, is as follows:

Sweet orange peel, in moderately fine powder	16 oz.
Glycerine	3 fl. oz.
Alcohol	q. s.
Water	q. s.

Having mixed 14 fl. oz. alcohol with 2 fl. oz. glycerine, the peel is moistened in a Wedgwood mortar with 12 fl. oz. of this mixture. After standing twelve hours percolation is conducted in the usual manner. The percolation is finished with a mixture of 2 parts alcohol and 1 part water. Reserving the first 14 fl. oz., add 1 fl. oz. of glycerine to the remainder, evaporate to 2½ fl. oz., which mix with the reserved portion. The author describes this preparation as possessing all the aroma of the orange peel. One fl. oz. mixed with 15 fl. oz. of sirup gives an excellent sirup. aurant. quite clear. By adding to a pint of simple sirup 4 fl. drm. of the extract and a few drops of solution of citric acid, a most delicately flavored and unfermentable sirup for mineral waters is produced.

Peach.—Oil of almonds, 3 drm.; pineapple oil, 3 drm.; tartaric acid, 3 drm.; alcohol, 80°, 1½ pt.

Pineapple.—Pineapple essence, 2 oz.; citric acid, 1 oz.; alcohol, 80°, 2 pt.

Raspberry.—Raspberry essence, 3 drm.; tincture of orris, ¼ oz.; citric acid, ¼ oz.; liq. carmine, 15 drops; extract rose (from pomade), ¼ oz.; alcohol, 85°, ½ pt.

Rhubarb.—1. Eight oz. sliced or bruised rhubarb, 5 oz. rectified spirit, 50 oz. distilled water; macerate four days; strain and set to subside; decant the clear, strain, mix, and evaporate to a proper consistence over a water bath at 160° F. (71° C.).

2. Compound.—Three drm. extract rhubarb, 1 drm. extract of aloes, softened with 4 drm. water; evaporate to an extract; dry in a warm place, and powder.

Sarsaparilla.—3. Sixteen oz. Jamaica sarsaparilla cut transversely, 280 oz. distilled water at 160° F. (71° C.), 1 oz. rectified spirit; macerate in the water for six hours, and decant the liquor; digest the residue in the remainder of the water for six hours more, mix the liquors, express and filter; evaporate by a water bath to 7 oz., or until it has a *sp. gr.* of 1·130; when cold, add the spirit.

4. Three and a half lb. sarsaparilla, 3 gal. distilled water; boil to 12 pt.; pour off the liquor, and strain while hot; again boil the sarsaparilla in 2 gal. water to half, and strain; evaporate the mixed liquors to 18 fluid oz.; when cold, add 2 fluid oz. rectified spirit.

5. One lb. sarsaparilla, 4 pt. boiling water; digest two hours; bruise the root, boil for two hours, filter, and express the liquid; repeat the decoction with 2 pt. water, as before; evaporate the mixed liquids to the consistence of a thin sirup, and when cold enough add sufficient rectified spirit to make up 16 fluid oz.

6. One lb. sarsaparilla; proceed as before; add sufficient rectified spirit to make the product up to 20 fluid oz.

7. Sixteen oz. bruised sarsaparilla; 2 oz. bruised licorice root, 2 oz. rasped guaiacum wood, 2 oz. sliced sassafras bark, 6 drm. sliced

mezereon, 7 pt. spirit (sp. gr. 0·935 = 13 u. p.); digest fourteen days, express, filter, evaporate to 12 fluid oz.; add 8 oz. sugar; as soon as this is dissolved, withdraw the heat.

8. Sixteen oz. sarsaparilla, 2 oz. licorice root, 2 oz. sassafras, 360 grn. mezereon, all in fine powder; 4 oz. glycerine, 8 oz. rectified spirit, 4 oz. water; macerate in a closed percolator for four days; let the percolation commence, and finish it by adding diluted alcohol (equal volumes of alcohol at 0·835 and water), until 2 pt. have been obtained. Reserve the first 12 oz., having added 4 oz. glycerine to the remainder of the percolate, which evaporate to 6 oz., and mix with the reserved portion.

9. There are different kinds of sarsaparilla extract; that most commonly used is the so-called sarsaparilla sirup, for soda water; it is made by adding to 1 gal of simple sirup 10 drops of anise oil, 20 drops of wintergreen oil, 6 oz. of caramel or burnt sugar for coloring and 20 drops of oil of sassafras, while the sarsaparilla is left out simply for the sake of economy. The oils should be first placed on some sugar and rubbed in a mortar, or mixed with some strong alcohol before adding them to the sirup. The honest fluid extract of sarsaparilla is, however, made by cutting the roots very fine, or buying them in powdered condition, and moisten 16 oz. with ½ pt. of diluted alcohol; let it stand half an hour, pack it closely in a percolator, cover the surface with a disk of cloth, muslin or linen, to prevent the disturbance of the powder, and pour on gradually 2 pt. of alcohol diluted with 1 pt. of water; when passed through, evaporate at a moderate heat, say 150° F., on a water bath to 1 pt., add 10 oz. sugar and strain while hot. It is seen that boiling is not applied, as the heat of 212° F. destroys the essential virtues of the drug. There is also a compound extract of sarsaparilla made like the above, with the addition of a little guaiacum wood, pale rose senna and licorice root. After preparation, a few drops of anise, sassafras and gaultheria oil are added in the manner above mentioned. The latter compound extract is also very often made by druggists with the sarsaparilla entirely left out; therefore, the only way to be sure that you have the sarsaparilla in, is to make the extract yourself.

Strawberry.—Pineapple oil, 1½ oz.; tincture of orris, ¾ oz.; tartaric acid, ¾ oz.; alcohol, 80°, 1½ pt.

Soup Extract.—Boil your vegetables for six hours in a bain marie and squeeze. In the liquor which comes from the vegetables, bones and beef are boiled for the same length of time as the vegetables. The fluid is then strained off and on cooling the fat is skimmed off and after a while a part of the fat is added again together with 3% salt. It is then evaporated till it has the consistency of sirup.

Vanilla.—Cut up fine 1 oz. vanilla bean, grind with 2 oz. of loaf sugar, in a mortar, mix 8 oz. of rose water and 24 oz. of alcohol 95°, add a portion to the vanilla and sugar, put in a displacer and pour on the balance of diluted alcohol. Add a few drops of caramel if not dark enough.

Walnut Shells. — A preparation with this harmless appellation is put up by a Berlin firm, but it contains, according to Schadler, a little nitrate of silver and chromate of copper in ammoniacal water used for the hair.

The above is but one specimen selected to show that humbugs are pretty equally distributed over the earth's surface, including China, while at the same time we are pleased to notice that some of our American preparations are totally harmless, while others are even useful and beneficial. We hope at the same time to have satisfied a pardonable curiosity in some of our readers. See the **Hair.**

Eyebrow, Pencil. See **Cosmetics.**

Eyelashes.—*Deficient Color.*—The following preparation may be carefully applied twice daily on the external aspect of the skin near the root.

Sulphur sublimed	1 oz.
Tincture of cantharides	1 oz.
White wax	8 oz.
Glycerine	2 oz.

Melt the wax and add the other ingredients and stir.

Dye for the Eyelashes.—Black.—Wash the lashes in Goulard water and afterward apply the following with a small brush:

Sublimed sulphur	1 part.
Lard	4 parts.
Glycerine	2 parts.

Melt the lard and mix in the glycerine and sulphur. Let it stand until cool.

Ingrowth.—The lashes of either lid must be held transversely with a pair of tweezers or forceps and curled away from the eyeball; they may be previously moistened with pure glycerine or egg. This should be repeated daily.

Lotion for the Eyebrows.—The composition of the lotion for the eyebrows is, as near as we can make out, camphor, oil of rosemary, chloride of ammonium, common salt, spirit and water. Try the following formula:

Common salt	1 drm.
Chloride of ammonium	10 grn.
Camphor	5 grn.
Oil of rosemary	10 drops.
Rectified spirit	1 drm.
Water to	1 oz.

Dissolve the oil and camphor in the spirit, the salts in the water, and mix.

Eyelashes, to Stimulate the Growth of.—Cologne, 2 oz.; liquid hartshorn, 1 drm.; tincture cantharides, 2 drm.; oil rosemary, 12 drops; lavender, 12 drops.

Eyelids, Granulated.—The trouble is commonly caused by a weak and impure state of the blood. Use sulphur and iron tonics for the blood and wash the eyes regularly, three times a day, with the following: Pure sulphate of zinc, 3 grn.; tincture of opium, 10 drops; water, 2 oz.

Eyes, The, *The Care of.*—At the sanitary convention held at Ann Arbor, Mich., not long ago, Dr. C. J. Lundy, of Detroit, read a paper on "Hygiene in Relation to the Eye," which should have the widest circulation, especially among teachers and school officers. A fruitful source of eye troubles is shown to be the excessive strain upon the muscles and nerves of the eyes due to faulty educational methods, the ill-planned and insufficient lighting of school rooms, poor ink and fine print in school books, and other causes which education might correct. In conclusion, Dr. Lundy laid down the following rules for the better care of the eyes:

1. Avoid reading and study by poor light.
2. Light should come from the side, and not from the back or front.
3. Do not read or study while suffering great bodily fatigue or during recovery from illness.
4. Do not read while lying down.
5. Do not use the eyes too long at a time for near work, but give them occasional periods of rest.
6. Reading and study should be done systematically.
7. During study avoid the stooping position, or whatever tends to produce congestion of the head and face.
8. Select well printed books,
9. Correct errors of refraction with proper glasses.
10. Avoid bad hygienic conditions and the use of alcohol and tobacco.
11. Take sufficient exercise in the open air.
12. Let the physical keep pace with the mental culture, for asthenopia is most usually observed in those who are lacking in physical development.

Another set of rules which gives additional information on the care of the eyes are drawn up to serve as a guide to students and others working by artificial light:

1. If the work be carried on at a table, the cover should be green.

2. If the light be given from a lamp or candle, it should be so covered with a shade as to prevent the glare from falling on the eye.

3. It will, in addition, be advantageous to have the candle or lamp covered with a globe or chimney of tinted glass; which may be green, blue, or opaline.

4. If gas is used it may be brought down by means of an india-rubber pipe to a lamp placed on the table, which may be arranged as before recommended.

5. If this cannot well be done, the gas globes may be of tinted glass, and the person should wear a shade over the eyes, or should sit with his back to the light.

6. If there is any defect of vision, compensating glasses should be worn, and they may be made of tinted glass.

Reading by firelight is also injurious on account of the glare, the quickly repeated dilatations and contractions of the iris, due to the changes in the intensity of the light, and the frequent alteration of the accommodation of the eye which the latter necessitates. Persons as cooks, compelled to work before a strong fire, should, if they experience any ocular inconvenience from the practice, wear smoked glasses.

Where the eyes are easily irritated by the wind or sun, etc., the daily use of one of the eyewashes to be recommended for weak eyes will be beneficial, as also a solution of camphor in rose water in the proportion of 1 to 8.

Eye Ointments, Eye Salves.—These preparations, even those that are used as cosmetics, or that fall within the range of domestic medicine, in general require such care in their preparation as to render them unfit articles of domestic manufacture. Slight errors in the proportions of the ingredients, or neglect to reduce the hard or gritty substances which enter into their composition to impalpable powder, has often been followed by very serious consequences, and even blindness. The following are a few advertised proprietary articles of the class, which, like all other nostrums, as a rule should be avoided by the reader:

1. Sugar of lead ..... 1 drm.
   Red precipitate ..... 1 drm.
   Camphor ..... 6 grn.
   Fresh butter (washed) ..... 2½ oz.

2. Verdigris (levigated) ..... ½ drm.
   Olive oil ..... 1 fl. drm.

triturate them together, and then add, of

   Yellow basilicon ..... 1 oz.

A popular nostrum in the cases noticed under No. 4 (infra), especially in those of a scrofulous nature.

3. Marshall's eye cerate.—Take—
   Sugar of lead ..... ½ drm.
   Calomel ..... 1 drm.
   Citrine ointment ..... 2 drm.
   Palm oil ..... 5 drm.

and carefully triturate them together, in a Wedgwood-ware mortar, as in No 1. In excoriations of the eyelids, chronic inflammations and ulcerations, blear eyes, etc.; in each largely diluted, to be safe.

Stye Lotion.—Camphor water, ½ oz.; muriate of morphia, 1 grn.

A Cure for Sties.—Among the most troublesome and often noticed eye affections are what are known as hordeolum, or common stye. Dr. Louis FitzPatrick, in the *Lancet*, differs from some of his professional brethren, who persist in ordering the application of poultices, bathing with tepid water, etc. These no doubt do good in the end, but such applications have the great disadvantage of prolonging the career of these unsightly sores, and encourage the production of fresh ones. Dr. FitzPatrick has found, after many trials, the local application of tincture of iodine exert a well-marked influence in checking the growth. This is by far preferable to the nitrate of silver, which makes an unsightly mark, and often fails in its object. The early use of the iodine acts as a prompt abortive. To apply it the lids should be held apart by the thumb and index finger of the left hand, while the iodine is painted over the inflamed papilla with a fine camel hair pencil. The lids should not be allowed to come in contact until the part touched is dry. A few such applications in the twenty-four hours is sufficient.

Watery Eyes.—The eyes are tender, cannot bear a strong light, and there is an abundant secretion of tears. Treatment: If acute, that is, coming on suddenly and from some injury due to dust, etc., they should be bathed in

1. Warm water ..... 1 part.
   Poppy decoction ..... 1 part.

Chronic cases are best treated by astringents, as—

2. Sulphate of zinc ..... 1½ grn.
   Water ..... 1 oz.
3. Alum ..... 2 grn.
   Water ..... 1 oz.
4. Sulphate of copper ..... 1½ grn.
   Water ..... 1 oz.
5. Nitrate of silver ..... 1 grn.
   Water ..... 1 oz.
6. Acetate of zinc ..... 1½ grn.
   Water ..... 1 oz.
7. Diacetate of lead ..... 11 grn
   Water ..... 1 oz.

The subsequent treatment of acute cases, after the inflammation has subsided, may be similar to that of the chronic.

Rectified spirit, 1 part, and water, 8 parts, may be used as a lotion to chronic cases.

Eye Waters.

1. Distilled vinegar ..... 1 fl. oz.
   Distilled water ..... 9 fl. oz.

Mix. In simple chronic ophthalmia, weak and blear eyes, etc.; also to remove minute particles of lime from the eyes. One-half fl. oz. of rectified spirit or 1. fl. oz. of good brandy is often added and improves it where there is laxness of the membranes.

2. Sulphate of zinc ..... 20 grn.
   Distilled water ..... ½ pt.

Dissolve. An excellent astringent eye water, for chronic ophthalmia and in ordinary ophthalmia, as soon as the inflammatory symptoms subside; also in weak, lax, watery, irritable eyes, etc. If there be much pain and irritability, 5 or 6 grains of acetate of morphia (not hydrochlorate) or 2 fl. dr. of wine of opium may be added.

3. Alum (crushed small) ..... 10 grn.
   Sulphate of zinc ..... 10 grn.
   Distilled water ..... ½ pt.

Dissolve. Use, etc., as the last.

4. Acetate (sugar) of lead ..... 10 to 12 grn.
   Distilled vinegar ..... 1 teaspoonful.
   Distilled water ..... ½ pt.

Dissolve. Uses, etc., as No. 2, particularly for children.

5. Sulphate of copper ..... 8 to 10 grn.
   Camphor julep ..... ½ pt.

Dissolve. In the purulent ophthalmia of infants and early childhood. The nostrum, Bate's Eye Water, has a similar composition, but is weaker.

6. Chloride of barium ..... 30 grn.
   Distilled water ..... ½ pt.

Dissolve. In the ophthalmia of scrofulous and syphilitic patients. It often affords relief

when other washes fail. When the eyes are very irritable, 5 or 6 or even 8 grn. of hydrochlorate of morphia may be added with advantage.

7. Sal ammoniac (pure).. .....1 drm.
Distilled water.. ..... ½ pt.

Dissolve. In similar cases to Nos. 1 and 2; also to arrest the progress and prevent the accession of sties, etc., 1 fl. oz. of distilled vinegar, or ½ fl. oz. of rectified spirit (or both), is sometimes added to it, and renders it more active. When there is much pain and irritation, 5 or 6 grn. of hydrochlorate of morphia, or 2 or 3 fl. drm. of wine of opium, is a useful addition.

8. Solution of acetate of ammonia..... ..... 2½ fl. oz.
Rose water..... 2½ fl. oz.
Camphor julep.... ..... 5 fl. oz.

Mix. A grateful and useful application to weak and swollen eyes, particularly after ophthalmia.

9. Hydrochlorate (or acetate) of morphia.....5 to 8 grn.
Distilled water..... 5 fl. oz.

Dissolve. In pain and extreme irritability of the organ, even during the acute stages of ophthalmia. Camphor julep is often used instead of water. When morphia is unobtainable, 2 or 3 fl. drm. of wine of opium or 3 or 4 fl. drm. of laudanum may be substituted, though inferior to it.

10. Opium (Turkey, pure).....10 to 15 grm.
Distilled water (boiling).... ¼ pint.

Dissolve. In the same cases as the last. One-half to 1 fl. oz. of solution of acetate of ammonia is often added.

11. Goulard's Eye Water:
Solution of diacetate of lead (Goulard's Extract), 15 or 16 drops (minims). Distilled water, none other, ½ pt.

Mix. Uses, etc., similar to No. 4.

12. (Krimer).—

Hydrochloric acid..... .....1 fl. drm.
Mucilage .....3 or 4 drm.
Water..... ..6 oz.

Mix. Used to remove minute particles of lime, mortar or iron from the eye, which it effects by its solvent action.

Observe.—Eye waters should be perfectly clear and free from any floating matter, however trifling. To secure this it is in general necessary either to filter them through bibulous paper, or a piece of clean, fine calico, or to carefully decant them after sufficient repose to allow the impurities to subside. When pure distilled water is used in their preparation, only some of them will require this. In using them a little of the liquid should be poured into a clean cup, gallipot, or glass, or into the clean palm of the left hand, when the eyes should be thoroughly wetted with it, either by means of a small piece of clean sponge or soft white rag, or the clean tips of the fingers of the right hand. In all cases it is advisable to bathe or wash the eyes in tepid water, and to wipe them dry before the application of the eye water; and in most cases, this is absolutely necessary to insure benefit from their use.

Eyes, Artificial, to Repolish.—The glass can be made smooth by the use of moist washed flour emery, after which it is polished with fine colcothar or rouge moistened with water, with rubbers of hat felt, finishing with a little moistened putty powder.

Insects' Eyes, to Mount.—Collect the insects and carefully cut off each eye, then put the whole of them in a weak solution of caustic potash for a few days until when examined under the microscope the eye appears free from dirt, then take them out carefully and partly dry them between blotting paper, afterward putting them in turpentine. Leave them in the turpentine for a day, then take out one at a time and lay it upon the glass slide on which you intend to mount it, then carefully drop a spot of Canada balsam on to the eye and warm the glass until the balsam has spread all round the eye, and then put the cover glass on the top of balsam, gently pressing it down until the eye is mounted well.

Eyes, Paint for Black. See **Rouges and Face Paints.**

Fabrics, to Bleach. See **Bleaching.**

Fabrics, Textile. See **Fireproofing.**

Fabrics, to Waterproof. See **Waterproofing.**

Face Paints. See **Rouges and Face Paints.**

Face Powders. See **Powders.**

Faience.—A name given to earthenware, enameled with painted designs and glazed. So called from its being made at Faenza; sometimes called Raphael ware or majolica.

Fainting.—Nothing more is necessary, ordinarily, than to lay a person who has fainted down in a current of air, or where the air from an open window or door will play upon his face, and he will recover in a few minutes. If in a street or other open place, persons should be prevented from crowding closely around. The clothes also may be opened and cold water sprinkled upon the face, hands and chest, and some pungent substance, as smelling salts, camphor, aromatic vinegar, etc., may be applied to the nostrils; and as soon as able to swallow, a little fresh water, or spirits and water may be given. Persons who faint easily should avoid crowded rooms and places where the air is close. See also **Accidents.**

Fans, Varnish for. See **Varnishes.**

Fat Oil.—Very thick turpentine.

Feathers, to Bronze. See **Bronzing.**

Feathers, Crushed and Bent.—To restore when feathers are bent and out of curl, they should be exposed to steam, or else put in boiling water for one minute, when they should be taken out and laid in temperate water for some time.

Feathers, to Clean. See **Cleansing.**

Feathers, to Dye. See **Dyeing.**

Feed, *Comparative Value of.*—The comparative value of horse feed is found by experiment to be as follows: 100 lb. of good hay is equal in value to 59 lb. of oats, 57 lb. of corn, 275 lb. of carrots, 54 lb. of rye or barley and 105 lb. of wheat bran.

Feet, Fetid, Lotion for.—*L'Union Medicale* gives this recipe: Permanganate of potash, 15 parts; distilled water, 1,000 parts. The feet to be washed twice a day with the lotion. They are then to be carefully dried, and powdered either with potato starch or lycopodium.

Feet, Offensive.—This condition is caused by excessive sweating of the feet, and the sweat, being confined, does not evaporate, and so decomposes.

Treatment: The feet should be washed daily in cold water, and afterward rubbed thoroughly dry; the water may contain ½ oz. powdered alum to the quart. Also at least once daily, especially after exercise, lave the feet with a solution of chlorinated lime, or—

Permanganate of potash .....80 grn.
Water.. ..... 1 pt.

Also before putting on the socks or stockings, the feet should be thickly powdered, especially between the toes, with

Chlorinated lime.....1 part.
Prepared chalk.....1 part.
Starch powder .....1 part.

The socks or stockings should be of thin flannel.

Felons, to Cure.—1. To cure a felon, says a correspondent, mix equal parts of strong ammonia and water, and hold your finger in it for fifteen minutes. After that withdraw it and tie a piece of cloth completely saturated with the mixture around the felon, and keep it there till dry.

2. Stir 1 oz. Venice turpentine in ½ teaspoon of water until the mass resembles candied honey. Spread on a cloth and wrap around the finger. It should be used as soon as the felon makes its appearance.

Fenton's Metal. See **Alloys**—*White Metal.*

Fermentation.—Chemists divide fermentation into five kinds, viz.:

1. Saccharine fermentation, by which starch and gum are converted into sugar.

2. Alcoholic or vinous fermentation by which sugar is converted into alcohol.

3. Viscous or mucilaginous fermentation, which converts sugar into slime or mucilage instead of alcohol.

4. Acetous fermentation, by which alcohol is converted into vinegar.

5. Putrid fermentation, or putrefaction, which is exhibited in its most marked form in the putrefaction of animal substances.

Fermentation, to Prevent.—1. According to the *Technologiste*, common rosin prevents the formation of acetic acid in fermented liquids without having any disturbing effect on the process of alcoholic fermentation. The peculiar effect of the hop may be due, it is suggested, to its resinous matter rather than to its oils. Resin is added to sweet wines in Greece.

2. Silicate of soda has been discovered to exert a very decided chemical action in checking alcoholic fermentation, in this respect being somewhat similar to borax, although much more energetic. A small quantity of the silicate will entirely arrest the fermentation of wine and also of milk.

Fermentation, to Stop in Wine.—Bottle the liquor, and immerse a number of the bottles, with the mouths only projecting, in a large vessel of water. Loosen the stoppers and heat the water until of a uniform temperature of 180° F., then remove the bottles, stopper and seal them tightly and place in an inverted position.

Fertilizers.—Hon. Levi Stockbridge, Professor of Agriculture of the Massachusetts Agricultural College, Amherst, publishes the following formulas, by means of which the farmer may compound his own fertilizers and thus save to himself large amounts now paid to those who make a business of preparing these phosphates:

To produce 50 bushels of corn more than the natural product to the acre, use:

1. Nitrogen, 64 lb., in the form of sulphate of ammonia;

2. Potash, 77 lb., in the form of chloride of potash;

3. Phosphoric acid, 31 lb., in the form of muriate of superphosphates.

To grow 1 ton of hay to the acre more than the natural product, use:

4. Nitrogen, 36 lb., in the form of sulphate of ammonia;

5. Potash, 31 lb., in the form of chloride of potash;

6. Phosphoric acid, 12 lb., in the form of superphosphate.

To produce 100 bushels of potatoes per acre and their usual proportion of tops more than the natural proportion of the land, and other quantities proportionally, use:

7. Nitrogen, 21 lb., in the form of sulphate of ammonia;

8. Potash, 34 lb., in the form of sulphate of potash;

9. Phosphoric acid, 11 lb., in the form of superphosphate.

To produce 25 bushels of oats and the usual proportion of straw per acre more than the natural product of the soil, and in proportion for other quantities, use:

10. Nitrogen, 10 lb., in the form of sulphate of ammonia;

11. Potash, 31 lb., in the form of chloride of potash;

12. Phosphoric acid, 8 lb., in the form of superphosphate.

To produce 1,500 lb., of dried leaf tobacco with the usual proportion of stalk more than the natural yield per acre of land, use:

13. Nitrogen, 149 lb., in the form of sulphate of ammonia.

14. Potash, 172 lb., in the form of sulphate of potash;

15. Phosphoric acid, 16 lb., in the form of superphosphate;

16. Lime, 160 lb., in the form of sulphate of lime (lime plaster).

These mixtures should be sown over the land broadcast when the ground is well prepared, before planting, and not put in the hills, so that the roots may seek the food and not concentrate and thereby cause the plants to burn up.

Cheap Fertilizer from Fish.—Pass fish refuse through mincing machine and expose in layers 3 in. deep in a kiln heated to 300° F. until properly dried.

Fertilizers, Cotton, Vegetable and Orange.—An orange fertilizer should have the following composition: ammonia, 3·25%; available phosphoric acid, 3·50%; potash, 14·50%. Cotton fertilizer: ammonia, 2·50%; available phosphoric acid, 7·50%; potash, 4%. The formula for the vegetable fertilizer varies with the kind of vegetable which is cultivated: Ammonia, 5% to 7%; available phosphoric acid, 6%; potash, 8% to 12%.

A cheap fertilizer consists of sulphate of ammonia, 60 lb.; nitrate of soda, 40 lb.; ground bone, 250 lb.; plaster, 250 lb.; salt, ½ bushel; wood ashes, 3 bushels; stable manure, 20 bushels. Apply the above amount to six acres. Labor in preparing included, it costs about $15. It is said to give as good results as most of the commercial fertilizers costing $50 per ton.

Fertilizing Powder.—Bone dust, 9 parts (very fine); plaster Paris, ½ part; sulphate ammonia, ½ part. Steep the seed in the drainings of a dunghill; drain, but while still wet, sprinkle with the powder and dry.

Ferro-Manganese. See **Alloys.**

Ferrotypes, Varnish for. See **Varnishes.**

Feuille Mort. See **Alloys.**

Fig Paste.—Fig paste is thus made: Ten lb. figs are cut up finely and boiled to a pulp with a little over 1 gal. of water. This is strained through a sieve, and 30 lb. of sugar are added. It is evaporated in a water bath until stiff. It may be poured into moulds of any desired shape. Carefully cooked corn starch may be added to the above before the last evaporation. After removal from the moulds, which must open or come apart, roll in sugar.

Files, to Sharpen by Chemical Means.—Boil the files in strong soda and water to clean off all grease, oil or gum. Then dip for a few minutes in a bath of nitric acid 1 part, water 4 parts; the length of time being less on fine files, as your experience may suggest.

To Resharpen Old Files.—Wash the files in warm potash water to remove the grease and dirt, then wash in warm water and dry by heat. Put 1½ pt. warm water in a wooden vessel, put in the files, add 3 oz. blue vitriol finely powdered, 3 oz. borax. Mix well, and turn the files so that every one may come in contact with the mixture. Add 10½ oz. sulphuric acid and ½ oz. cider vinegar. Remove

the files after a short time, dry, rub with olive oil, wrap in porous paper. Coarse files should be kept in the mixture for a longer time than fine ones.

Files, to Sharpen.—The files must be thoroughly cleansed in warm water containing a small quantity of potash, which readily removes all the grease and dirt. After they are thus cleansed they must be washed with warm water and dried by artificial heat. Next place 1 pt. of warm water in a wooden vessel and put in as many files as the water will cover, then add 2 oz. blue vitriol (sulphate of copper), finely pulverized, and 2 oz. borax, well mixed, taking care to turn the files over so that each may come in contact with the mixture. To the above mixture now add 7 oz. sulphuric acid and ¼ oz. cider vinegar, which will cause the files to assume a red appearance at first, but they will in a short time resume their natural color. Then remove them, wash in cold water and dry by artificial heat. When dry, sponge with olive oil, wrap in porous paper, and lay aside for use.

Fillers for Wood.—1. Take equal parts japan boiled linseed oil and turpentine, and half that quantity starch. Mix thoroughly, and apply with a sponge or flannel. When the polish is for walnut, a little burnt umber is added to the solution, and a little Venetian red when for cherry wood.

2. Hard Wood Filler.—Use boiled oil and enough corn starch to make a very thick paste. Add a little japan, and reduce with turpentine. Add no color for white oak; for dark ash and chestnut use a little raw sienna; for walnut, burnt umber and a very little Venetian red; for bay wood, burnt sienna. Use enough color to cover the white of the starch. Apply with brush and rags. Let it dry forty-eight hours, or until it is in condition to rub down with No. 0 sandpaper, without much gumming up, and if an extra fine finish is desired, fill again with the same materials, using less oil, but more of japan and turpentine. The second coat will not shrink, it being supported by the first coat. When the second coat is hard, the wood is ready for finishing up in any desired style or to any degree of nicety by following up the usual methods. This formula is not intended for rosewood, and will not be satisfactory if used therefor.

3. Boiled linseed oil, 1 qt.; turpentine, 3 qt.; corn starch, 5 lb.; japan, 1 qt.; calcined magnesia, 2 oz.; mix thoroughly.

4. Whitening, 6 oz.; japan, ½ pt.; boiled linseed oil, ½ pt.; turpentine, ½ pt.; corn starch, 1 oz.; mix well together and apply to the wood. Add coloring if required.

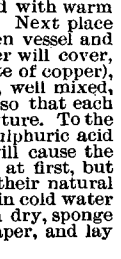
5. Linseed oil, 1 qt.; spirits of turpentine, ½ pt.; lime, the size of a baseball, broken fine. Let the mixture simmer on a stove, covered over, for two or three hours, then strain through a coarse cloth. It is to remain on twenty-four hours, then rub off with a woolen cloth and polish.

6. Filling for Cracks.—A very complete filling for open cracks in floors may be made by thoroughly soaking newspapers in paste made of 1 lb. flour, 3 qt. water, and a tablespoonful of alum, thoroughly boiled and mixed. Make the final mixture about as thick as putty, and it will harden like papier mache. This paper may be used for moulds for various purposes.—*Cal. Architect.*

7. *German Wood Filling.*—Fill the pores of the wood with new tallow and plaster of Paris, well amalgamated before a fire, if the weather is cold. Darken, if required, with any coloring to suit. When well rubbed in, give a coat of shellac, and French polish or varnish.

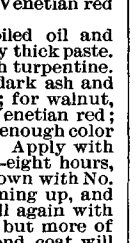
American Wood Filler.—Apply to the wood with a brush the following mixture: Pulverized starch by weight, 3 parts; heavy spar, 3 parts; ½ part by weight of siccative, with enough turpentine to make the consistency of ordinary varnish. For dark woods add to the siccative umber up to ½ part. Rub across the grain of the wood with a piece of felt fastened to a piece of wood. Let the wood dry about eight hours, rub with glass paper, then polish and varnish.

Filters.—*Filter, an Inexpensive.*—Use two stone pots or jars, as shown in the accompanying engraving, the bottom one being a water jar with side hole, if it can be procured; otherwise, if no faucet can be used, the top jar can be removed to enable the water to be dipped out. The top jar must have a hole drilled or broken in the bottom, and a small flowerpot saucer inverted over the hole. Then fill in a layer of sharp clean sand, rather coarse. A layer of finer sand, a layer of pulverized charcoal with dust blown out, then a layer of sand, the whole occupying one-third of the jar.



Filters, Carbon for. See **Carbon.**

Filter, Home Made.—To make a filter with a wine barrel, procure a piece of fine brass wire cloth of a size sufficient to make a partition across the barrel. Support this wire cloth with a coarser wire cloth under it and also a light frame of oak, to keep the wire cloth from sagging. Fill in upon the wire cloth about three inches in depth of clear, sharp sand, then two inches of charcoal broken finely, but no dust. Then on the charcoal four inches of clear, sharp sand. Fill up the barrel with water and draw from the bottom.



A Quick Filter.—Take a clear piece of chamois skin, free from thin places; cut it of the desired size, wash it in a weak solution of soda or any alkali to remove the grease, and, rinse thoroughly in cold water before using. Tinctures, elixirs, sirups, and even mucilages are filtered rapidly. A pint of the thickest sirup will run through in four or five minutes. By washing thoroughly after each time of using it will last a long time.

Filtering Stone.—K. Steinman, in *Tiefenfurt bei Gorlitz*, proposes filtering plates from the following mixture:

Clay	10 parts	or 10	or 15
Levigated chalk	1	1	1
Glass sand, coarse	55	..	..
Glass sand, fine	..	25	65
Ground flint	..	30	5

The ingredients are mixed thoroughly in water, moulded, and hard burnt.—*Dingler's Journal.*

Filtration is the process of separating insoluble matters, precipitates, etc., by means of porous media which allow the passage of the liquids only; and is used for rendering liquids, as tinctures, etc., clear and transparent, and separating valuable precipitates. Filters are made of various substances, but those of unsized paper are well suited for all liquids that are not corrosive or viscid, and are in general use for pharmaceutical purposes. Filtration affords the best method of separating and washing precipitates. When filter papers become wet they are very tender and the liquid should be added gradually. To fold filter papers, fold first on its diameter, then at right angles, then open out so that three folds are left on one side and one on the other.

Filtration, Fessenden's Rapid.

FIG. 1.

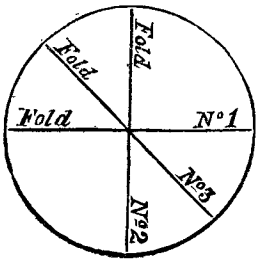


FIG. 2.

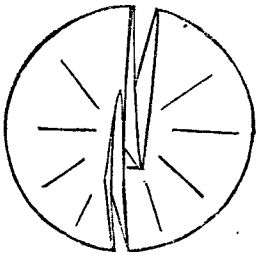
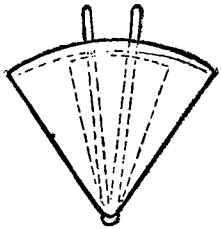


FIG. 3.

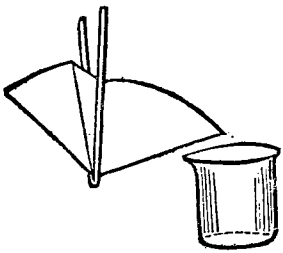
FIG. 4.



The following method enables filtrations to be made very rapidly, and in such a manner that the precipitate can be readily removed. Use prepared filter paper only.

The filter paper is folded three times; folds Nos. 1 and 2 are toward the reader, No. 3 from

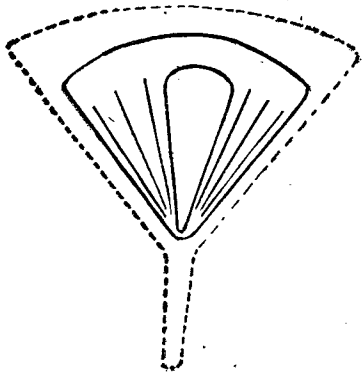
FIG. 5.



him. The filter is then gathered (Fig. 2) and a piece of glass rod, bent at a very acute angle inserted in the cleft of the filter (Figs. 3 and 4), thus giving a filtration surface of nearly four times the usual one.

The filtration being complete, the glass rod is grasped by the projecting ends and lifted from the funnel, bearing the filter upon it. One end of the filter paper is then bent down and the precipitate is easily washed off (Fig. 5).

FIG. 6.



An improvement on this is to use instead of the glass rod a plate of glass (Fig. 6) ribbed on both sides. This renders the filtration very rapid indeed.—*Chem. News.*

Finings.—A solution of gelatine, used to clarify beer, wine, etc. Isinglass (ordinary), 1 lb.; stale beer, cider, or vinegar, 3 or 4 pt. Mix and macerate until the former becomes gelatinous, then reduce it to a proper consistence with weak, mild beer, cider, or any other liquid that the finings are intended for. A pt. or more is the usual dose for a barrel of beer or porter and a qt. for a hogshead of wine.

Fires, Colored. See **Pyrotechny.**

Fire Extinguishing Agents.—Vienna Fire Extinguishing Agent.—A solution of 5 parts ferrous sulphate (copperas), 20 parts ammonium sulphate, 125 parts water.

Other Mixtures.—1. Alum, 24%; ammonium sulphate, 52%; ferrous sulphate, 4%.

2. Boric acid, 16 parts, by weight; alum, 24 parts; ferrous sulphate, 20 parts; dissolve in 160 parts of water. The solution is slowly poured into a cold solution of sodium hyposulphite 24 parts by weight; water glass, 40 parts; water, 640 parts.

3. Johnstone's.—Make a mixture of equal parts of pyrolusite (manganese dioxide), potassium chlorate, potassium nitrate. Moisten with water glass and press into a block. Place the block in a pasteboard box. Several boxes, connected by fuses, are suspended from the ceiling of a room.

4. Bucher's fire extinguishing powder contains 59 parts saltpeter, 36 parts of sulphur, 4 parts of charcoal, 1 part of oxide of iron. We fail to see the advantage of this peculiar sort of impure gunpowder as a fire extinguisher.

5. One of the best solutions for the extinction of incipient fires consists of crude calcium chloride 20 parts, salt 5 parts, dissolved in water 75 parts. Keep at hand and apply with a hand pump.

6. Hand Grenades for Extinguishing Fires.—Fill thin, spherical bottles of blue glass with a solution of calcium chloride, salammoniac or borax.

7. Fire Extinguishing Powder.—Eight parts common salt, 6 parts sodium bicarbonate, 2

parts Glauber's salt, 2 parts calcium chloride, 2 parts sodium silicate.

8. Common salt, 60%; salammoniac, 60%; sodium bicarbonate, 80%.

9. Salammoniac, 100%; sodium sulphate, 60%; sodium bicarbonate, 40%.

10. How to Treat a Burning Chimney.—Shut all the doors of the room so as to prevent any current of air up the chimney, then throw a few handfuls of common fine salt upon the fire in the grate or stove. This will immediately extinguish the fire in the chimney. In the process of burning the salt, muriatic acid gas is evolved, which is a good extinguisher of fire.

11. Fire Extinguishers, To Charge.—The Babcock fire extinguisher is charged with a solution of bicarbonate of soda in water and sulphuric acid in a lead bottle, which, when required, is turned over by a crank, spilling the acid into the charge of soda water. Carbonic acid gas is instantly generated, by which a pressure is obtained sufficient for throwing the whole contents of the apparatus with much force through a nozzle for fire purposes. Use of sulphuric acid 5 parts, bicarbonate of soda 6 parts, by weight. Other combinations are used, such as carbonate of ammonia, potash, etc. Iron can be used for the alkaline reservoirs.

12. Eight lb. carbonate of soda, 4 lb. alum, 3 lb. borax, 1 lb. carbonate of potash and 24 lb. silicate of soda solution are mixed together; 1½ lb. of this mixture is added to each gal. of water when required for use. The object is to cover everything with a fireproof film or deposit.

13. A committee of the Polytechnic Society of Munich have lately issued a report on the means to be adopted for extinguishing burning petroleum. This states that since concentrated water of ammonia evolves a great amount of gas when heated, and this gas is unable to sustain the combustion of any substance, it may be asserted that petroleum will not continue to burn even in a room filled with atmospheric air wherein a considerable proportion of ammonia gas is present. The place where the petroleum is stored must be broken up in compartments, so as to limit the bulk. The ammonia water must contain at least 10% of the gas. The proposed method of employing the agent is to keep a bottle full of it on each cask; the bottle and its contents would remain intact till fire caused the destruction of the one and the liberation of the other, so that there would be no loss except when needed.

14. The now well known extincteur introduced by Sinclair is a vessel filled with water charged with carbonic acid gas under great pressure.

15. Foster, of Bolton, has introduced an extincteur in the form of a portable pump, which can draw a continuous water supply from any source, and saturate it with carbonic acid under pressure before emitting it in a jet.

16. To Extinguish the Flame of Petroleum or Benzine.—Smother with a woolen cloth or carpet, or a wet muslin or linen cloth. Or the flames may be extinguished by throwing on earth or sand.

Fire Kindlers.—1. Dip the wood in melted resin. The following composition is sometimes used: 60 parts melted resin and 40 parts tar, in which the wood is dipped for a moment. Or, take a qt. of tar and 3 lb. of resin, melt them, then cool, mix as much sawdust with a little charcoal added as can be worked in. Spread out on a board, and when cold break up into lumps the size of a hickory nut, and you will have enough kindling to last a good while.

2. Use the cheapest rosin and add about 2 oz. of tallow to each lb. of the rosin. Melt the rosin first and add the tallow. Either smear over small blocks of wood or mix with sawdust and pour into moulds made of boards which can be knocked apart and the mass broken up.

Fireproof Glue. See **Glues.**

Fireproof Ink. See **Inks.**

Fireproof Paint. See **Paints,** also.

Fireproofing.—*Cloth.* See *Textile Fabrics* below.

Paints.—1. Various substances have been proposed as fireproof coatings for the protection of woods employed for building purposes, but most of them have been abandoned as being either too costly or not sufficiently durable. The following, invented by Vildé and Schambeck, seems to succeed. The paint consists of 20 lb. finely pulverized glass, 20 lb. finely pulverized porcelain, 20 lb. any sort of stone in powder, 10 lb. calcined lime and 30 lb. water glass (silicate of soda), such as usually found in commerce. The solid elements having been powdered as finely as possible and sifted, are moistened and then intimately mixed with the water glass. This yields a mass of sirupy consistence that may be employed for painting either alone or mixed with color. The addition of the lime gives a certain unctuosity to the mass for whitewashing, and its combination with the silicic acid of the soluble glass serves to bind the other materials together. The proportions of the different elements above mentioned may be changed, save that of the water glass, which must remain constant. These elements may even be replaced one by another; but it is always well to preserve the lime. Instead of the silicate of soda (soluble glass of soda) soluble glass of potash might be used, but the former is less expensive. The coating is applied with a brush, as other paints are, as uniformly as possible over the surface to be protected. The first coat hardens immediately, and a second one may be applied six hours or more afterward; two are sufficient.—*La Papeterie.*

2. Take of common lime, freshly slaked, of hydraulic lime, and of silicious or argillaceous matter (sand or pulverized slate), equal parts; to which add cows' milk in sufficient quantity to give the whole, when thoroughly mixed, the proper consistency for laying and spreading with the ordinary brush. Any desired coloring matter may be added. The addition of glue or rosin may in some cases be of value. The proportions may vary considerably, but those above given are considered to produce the best result.

3. Dissolve crushed rosin in turps sufficient to make it as thick as cream. Then mix together in a paste oxide of zinc and boiled linseed oil, and add it to the other; it will become white. Thin it out for use with boiled oil and turps. The above paint will take most pigments, and should be put on flowing.

4. Two substances are in general use for the purpose of protecting wood against combustion, viz., zinc chloride and soda silicate. Both of these have certain drawbacks. A paint consisting of zinc chloride volatilizes when the material on which it is spread is heated or exposed to flame, and its vapors are insupportable by human beings. It would therefore be difficult, if not altogether impossible, to enter wooden dwellings painted with the zinc salt when on fire, and thus the salvage of furniture, etc., would be obstructed. The water glass paint, on the other hand, is liable to be washed away when exposed to rain or other watery influences. Sieburger therefore recalls to mind two fireproof compositions which were formerly in much use. The one is a saturated aqueous solution of 3 lb. alum and 1 lb. copperas, with which the wood is twice painted; after drying, a solution of copperas in which powdered clay is suspended is brushed over the alum layer. The other protective paint is a mixture of 1 lb. sulphur, 1 lb. clay and 6 lb. copperas, spread as powder over wood previously washed with a solution of glue.—*Ding. Polytech. Jl.*

Paper that Resists the Action of Fire and Water.—1. Mix from 5 to 75 parts of aluminum

sulphate with 62½ parts of asbestos fiber. Moisten this mixture with chloride of zinc and wash thoroughly with water. Treat with a solution composed of 20 to 25 parts of pure aluminum sulphate and 2½ parts of resin soap. Afterward manufacture into paper in the same way as with ordinary pulp. See also *Writing Materials* below.

2. The *Chemiker Zeitung* gives the following modes of preparing incombustible writing and printing paper, which appear worth attention. The best asbestos is treated with a preparation of permanganate of potash and then with sulphuric acid. Ninety-five per cent. of this asbestos is mixed with five per cent. of wood pulp in water containing borax and glue. A fireproof writing ink is made by mixing Indian ink and gum with chloride of platinum and oil of lavender; for printing ink lampblack and varnish are to be substituted.

3. Pass the paper through strong solution of alum and dry.

Textile Fabrics.—Several preparations for rendering textile and other inflammable fabrics incombustible and practically fireproof have been recently introduced by Martin and Tessier, of Paris. The compositions are said to be of an inexpensive nature and capable of rendering incombustible all kinds of readily inflammable substances, such as woven and other fabrics of cotton and other fibrous materials, paper, printed or otherwise, including bills of exchange and other securities, woodwork, theatrical scenery, straw, etc.

1. The first composition, which may be applied to all kinds of fabrics, without deteriorating them in any way, consists of sulphate of ammonia (pure), 8 lb.; carbonate of ammonia, 2·5 lb.; boracic acid, 3 lb.; borax (pure), 1·7 lb.; starch, 2 lb.; water, 100 lb. It is simply necessary to steep the fabrics in a hot solution composed as above until they have become thoroughly impregnated, after which they are drained and dried sufficiently to enable them to be ironed or pressed like ordinary starched goods.

2. A second composition, to be used for theatrical scenery (or the mounted but unpainted canvas to be used for this purpose) and also for woodwork, furniture, door and window frames, etc., is to be applied hot with a brush like ordinary paint. It is composed of boracic acid, 5 lb.; hydrochlorate of ammonia or sal ammoniac, 15 lb.; potash feldspar, 5 lb.; gelatine, 1·5 lb.; size, 50 lb.; water, 100 lb.; to which is added a sufficient quantity of a suitable calcareous substance to give the composition sufficient body or consistency.

3. A third composition to be used for coarse canvas or sailcloth, cordage, straw and wood, is applied by immersing the articles therein or by imbibition, and consists of boracic acid, 6 lb.; hydrochlorate of ammonia or sal ammoniac, 15 lb.; borax (pure), 3 lb.; water, 100 lb.

4. A fourth composition, applicable to all kinds of paper, whether printed or not, including securities, books, etc., is formed of sulphate of ammonia (pure), 8 lb.; boracic acid, 3 lb.; borax, 1·7 lb.; water, 100 lb.

The solution is to be placed in a vat heated to 122° F. (50° C.) at the end of the paper making machine, and the paper as it leaves the machine is passed through the solution in this vat, so as to be completely impregnated therewith, after which it is dried upon a warm cylinder and then wound on a reel. If the paper be in sheets or printed, it is simply immersed in the above heated solution, spread out to dry, and afterward pressed to restore the glaze destroyed by the moisture. The above compositions insure a degree of incombustibility without precedent as regards the preservation of the materials to which they are applied. The proportions of the several ingredients are given as examples only, and may be varied as found necessary in practice.—*Sci. Am.*

5. Among the means recommended for this purpose we may, in the first place, mention one of exceeding simplicity, applicable to muslins and all dresses which are starched after washing. It is merely necessary to mix the starch with sal ammoniac and plaster of Paris. The goods thus dressed may certainly be set on fire by the flame of a match, but the flame does not extend. The inventor of this first process afterward recommended

Borax	12 parts.
Epsom salts	9 parts.

dissolved in 80 parts of warm water. The tissues to be prepared are dipped in the solution till thoroughly saturated. They are then pressed, wrapped in a cloth, wrung again, laid between cloths, and passed through a mangle, after which the articles are ironed while still damp. The necessary quantity of starch can be stirred in the saline solution.

6. Vogt dissolves—

Sublimed sal ammoniac	2 parts.
Sulphate of zinc	1 part.

in 15 to 20 parts of water. The starch or other ingredients required for stiffening or finishing are added to the solution. The dresses, etc., are steeped in the mixture till thoroughly saturated, pressed well out and dried. According to Siebrath a good result may be got by steeping the dresses in a solution containing 5% alum and 5% phosphate of ammonia. Tissues so treated are said not to burn, even if previously rubbed with gunpowder. The powder deflagrated, but left the tissue unburnt.

7. Hottin proceeds in a very similar manner. He takes a solution of acid phosphate of lime, mixed with ammonia in excess. After decolorizing it with animal charcoal he adds 5% gelatinous silica, and evaporates to dryness. The dresses to be made fireproof are laid in a 30% solution of this mixture, which he calls "Hottine."

[If this mixture has once been evaporated to dryness, we do not see how it can be all brought into solution again without the aid of an acid. Acid phosphate of lime, if mixed with ammonia, will be precipitated as insoluble tribasic phosphate of lime, while the excess of the phosphoric acid will combine with the ammonia. So that the process is, in reality, merely a method of making phosphate of ammonia.]

8. Among other agents proposed for the same purpose are soluble glass, tungstate of soda, ammonia, alum and hyposulphite of soda.

9. According to Versman and Oppenheim, phosphate of ammonia is mixed with half its weight sal ammoniac, and a 20% solution of the mixture is used. Tissues which are to be afterward ironed are afterward treated with a 20% solution of the tungstate of soda.

10. The phœnix essence of M. Pereles consists of a mixed solution of tungstate, silicate and phosphate of soda.

11. Nicoll proposed a bath of—

Alum	6 parts.
Borax	2 parts.
Tungstate of soda	1 part.
Dextrine dissolved in soap lye	1 part.

The dextrine is said to cause the salts to adhere better to the fiber.

12. More recently two receipts have been given in the *Berichte der Deutsch Chem. Gesellschaft* (XII., p. 2391).

The first is:

Sulphate of ammonia	8 parts.
Carbonate of ammonia	2½ parts.
Boracic acid	2 parts.
Borax	1¾ parts.
Starch	2 parts.
Water	100 parts.

The dresses or other tissues are taken through this mixture boiling.

13. The second receipt

Boracic acid	5	parts.
Sal ammoniac	15	parts.
Potash feldspar	5	parts,
Gelatine	1½	parts.
Starch paste	50	parts.
Water	100	parts.

This mixture is applied with a brush.—*Industrie-blaetter.—Chemical Review.*

14. Steep the fabric in almost any saline solution, such as borax, alum, sal ammoniac, etc. The addition of about 1 oz. alum or sal ammoniac to the last water used to rinse a lady's dress, or set of bed furniture, or the addition of a less quantity to the starch used to stiffen them, renders them uninflammable, or at least so little combustible that they will not readily take fire, and if kindled, will not burst into flame.

15. Make a solution of sodium tungstate 28° Tw., mix with 3% of sodium phosphate.

16. Equal weights of acetate of lime and chloride of calcium, dissolved in twice their weight of hot water, is a fireproofing mixture for fabrics.

17. Fireproof Wash for Clothes.—Tungstate of soda is excellent, but rather too expensive; satisfactory results are obtained by the simple solution of 4 parts borax and 3 parts Epsom salts. The only precaution necessary is that the solution (which is easily made by adding 3 or 4 parts warm water to 1 part of the mixture) be used immediately, since the active principle, the insoluble borate of magnesia, soon precipitates.

18. The *Manufacturers' Review* translates from Hager the following directions for preparing a starch paste, impregnation with which renders a fabric incombustible: 10 parts calcined and pulverized bones are treated with 50 parts hot water, to which 6 parts concentrated sulphuric acid are gradually added. The mixture is well stirred, and left to stand two days in a warm spot, being stirred from time to time: 100 parts distilled water are then added, and the liquid filtered. 5 parts sulphate of magnesia (Epsom salts) are dissolved in 15 parts distilled water, the solution added to the first, and caustic ammonia added till the liquid smells of it. The precipitate is thrown on a linen filter, pressed, dried in a moderately warm place, and rubbed to a very fine powder. Of this powder, 2 parts are mixed with exactly 1 part tungstate of soda and 6 parts wheat starch, and a little indigo blue added to impart a bluish tint to the powder. In order to use this powder, it is stirred up with about twice its weight of cold water, and enough hot water is then added to produce a gelatinous liquid, in which the fabrics that are to be rendered incombustible are steeped.

1. *Deal boards* become almost incombustible when painted over with a diluted solution of water glass or silicate of soda. The water glass is usually sold as a thick fluid, like honey. This may be thinned out with water, about six or seven times its own bulk. The water must be soft—boiled water will do—and apply the solution warm. In about twenty-four hours apply a second coat, and perhaps a third. Use a new brush, and wash in clean water after using, or it will get too soft. Avoid grease or fat on the boards before painting them.

2. Soak the wood in a strong solution of alum and sulphate of copper. About 1 lb. of alum and 1 lb. of sulphate of copper should be sufficient for 100 gal. of water. These substances are dissolved in a small quantity of hot water, then mixed with the water in the vessel in which the wood is to be steeped. The timber to be rendered fireproof can be kept under the liquor by stones or any other mode of sinking it. All that is required is a water-tight vessel of sufficient dimensions to hold enough of the liquor to cover the timber, which should be allowed to steep for about four or five days. After this it is taken out and allowed to dry thoroughly before being used.

3. A plan of rendering the wood partially fireproof is to whitewash it two or three times.

4. The wood is twice painted over with a hot saturated solution of 1 part green vitriol and 3 parts alum. The wood after drying is again painted with a weak solution of green vitriol, in which pipe clay has been mixed to the consistency of ordinary paint. This coat is renewed from time to time.

5. Shingle roofs, and indeed all woodwork, may be rendered less liable to take fire from falling cinders, etc., by coating it with a wash composed of lime, salt, and fine sand or wood ashes. This compound also preserves the wood, and should be applied in the same manner as ordinary whitewash.

6. Fireproof wash for shingles, etc. Dissolve in a barrel of hot water:

Sulphate of zinc	20 lb.
Alum	20 lb.
Caustic potash	8 lb.
Manganic oxide	8 lb
and add	
Sulphuric acid	8 lb.

Pack the shingles loosely in another barrel and fill with the liquid, holding the shingles under the mixture. Fill up the first barrel also with shingles, soak for 3 hours and pile to dry, and repeat until all the shingles are fireproofed. After the house is shingled paint with oxide of iron paint, tempered with other mineral color in boiled linseed oil, and mixed to suit your taste as to shade of color.

Timber.—1. By Payne's process, patented in 1841, the timber is inclosed in a close iron vessel in which a vacuum is formed. A solution of sulphate of iron is then admitted into the vessel, which instantly insinuates itself into all the pores of the wood, previously freed from air by the vacuum, and after about a minute's exposure, impregnates its entire substance. The sulphate of iron is then withdrawn, and another solution, of muriate of lime, thrown in. The two salts then react upon each other and form two new combinations within the substance of the wood—muriate of iron and sulphate of lime. Timber thus treated is preserved both from rot and from the attack of worms, and is perfectly incombustible.

2. Dr. Burnett's process consists in treating the timber to a solution of chloride of zinc, 1 lb. chloride of zinc to 4 gal. water. It requires to be immersed for about two days for each inch in thickness, and afterward left to dry for a period of fourteen to ninety days. This renders the wood incombustible, but not so thoroughly as the former process. It is likewise a preservative.

3. There are many chemicals employed to render articles uninflammable, such as common salt, sulphate of ammonia, tungstate of soda, etc. The wood would require to be thoroughly dried, and then saturated with one of the above salts dissolved in water. The woods least inflammable are beech, oak, American elm, plane tree, and other non-resinous woods.

4. A trial at Devonport Dockyard, ordered by the Admiralty, of the method of rendering wood uninflammable by saturating it with tungstate of soda, showed that the prepared wood is under all circumstances much less readily inflammable than ordinary wood; that shavings and chips of the preparad wood, although they may be made to burn, cannot be made by themselves to set fire to substantial timbers of the prepared wood; that prepared timber steadfastly resists mere flame, although it may be made to burn when acted upon continuously by great heat. The cost of preparation and the largely increased weight of the prepared wood are disadvantages to be set against these advantages.

5. Some years since, experiments were made by Prof. Pepper, with a view of rendering articles fireproof by the use of chemical solutions. The following were the results: Treated with

alum, the article soon yielded, and burst into flames; with borax, it lasted longer; with tungstate of soda, longer still; with phosphate of ammonium, it resisted best of all.

6. Wood can be rendered practically fireproof by first drying it thoroughly and then coating it with common whitewash. If the wood is not thoroughly dry, the coat of whitewash shells off, but it is a very difficult matter to burn wood which has been plastered over with whiting or even limewash.

Paterno reviews several substances which are used; some of them, as sodium tungstate, answer very well, but are objectionable on account of cost. The author has made numerous experiments with various substances in their power of rendering fabrics non-inflammable. He recommends the following as being quite equal to sodium tungstate.

7. A mixture of borax and sulphate of magnesia. To prepare this, for 20 lb. water take 3 lb. borax and 2¼ lb. sulphate of magnesia. The action of this mixture depends on the formation of a borate of magnesia, insoluble in water, hot or cold, which surrounds and impregnates the threads of the texture or the fibers of the wood, and thus renders the development of combustible gases and the spread of flame very difficult.

8. A mixture of sulphate of ammonium and sulphate of lime, or gypsum, in various proportions, according as it is to be applied to materials of greater or less fineness. The sulphate of lime is transformed, with the salt of ammonium, into a double compound, which produces none of the disagreeable effects of the latter, or at least in a very slight degree. The action of this mixture of salts—which, on account of its cheapness, may be extensively employed—depends on an incrustation of the fibers, which prevents the spread of fire, and, on the other hand, extinguishes flame in consequence of the volatilization of the salt of ammonium at a high temperature. Take 1 lb. liquid ammonia and 2 lb. sulphate of lime, and a single coating with a concentrated solution of this compound, which costs little, suffices to preserve wooden structures from burning. The wood is not rendered absolutely incombustible, but it is not easy to light, and ceases to burn when the action of foreign inflammable substances comes to an end. Roofing often washed with rain water, and presenting every condition favorable for easily taking fire, was impregnated with this mixture. It had been covered with a layer of tar and drying oil, and thus rendered more liable to burn. Nevertheless, all attempts to set it on fire failed. The experiments have been so satisfactory that the Austrian Minister of Finance has recommended this method to be used in all the establishments of the empire. —*Oest. Zeit. fur Berg-u.-Hut.-W.*

Wicks, to Fireproof.—To prepare lamp wicks so that they will not burn out, steep them in a concentrated aqueous solution of tungstate of soda and then dry thoroughly in an oven.

Incombustible Wick.—Sea sand, 15 parts; powdered fireclay, 5 parts; fine wood sawdust, 10 parts; powdered glass, 2½ parts; cotton or cotton dust, 2½ parts. Moisten this mixture, dry, and fire at a full red heat for half an hour. This is said to yield a permanent and porous material for lamp wicks.

Writing Materials.—1. A really incombustible paper, without a fireproof ink, would be a very valuable article in many businesses, and for many purposes of everyday life, but if it can be supplemented by a fire proof ink, its value will be enchanced tenfold. Such a discovery G. W. Halfpenny believes he has made, and that paper prepared by his process under such circumstances as fires in houses, factories or other buildings is ordinarily incombustible. The inventor prepares his paper in the usual manner from a pulp consisting of vegetable fiber, asbestos, alum and borax, in or about the following proportions: Vegetable fiber, 1 lb.; asbestos, 2 lb.; borax, ⅞ lb., and alum, ½ lb. The vegetable fibers are minutely divided and treated in the manner usual in the production of ordinary paper; the asbestos is also divided as much as possible and the two are then intimately mixed with the alum and borax in a sufficient quantity of water to make a pulp of the requisite consistency, which is then made into paper by any of the well known processes. The proportions given may be varied to suit the quality and nature of the desired product, and also to suit the different qualities of the raw materials. Thus the inventor says he has made incombustible paper in which the proportions of the ingredients varied from 50 to 70 parts of asbestos, and from 30 to 50 parts of flax or other vegetable fiber, with only 2½ per cent. each of alum and borax. He proposes to use in some cases silicate of soda, in order to insure hardness and coherence in the substance of the paper after it has been acted upon by fire. In order to obtain a paper of great strength and flexibility the sheets may be made of linen or other woven fabric, and coated on both sides with the incombustible paper. The fireproof ink for use in writing or printing on the incombustible paper is made of the following substances: Graphite, 22 drm.; copal or other resinous gum, 12 grn.; iron sulphate, 2 drm.; tincture of nutgalls, 2 drm.; and sulphate of indigo, 8 drm. These materials are mixed together and boiled in water, the graphite of course having been reduced to an impalpable powder. This ink, besides being fireproof, is said to be insoluble in water under ordinary circumstances, and is black; but when colored inks are desired the graphite is replaced by an earthy or mineral pigment of the desired color.

2. Fireproof paper was prepared by L. Frobeen by bleaching choice asbestos fibers with sulphurous acid, and adding 5% of ground wood fiber with borax or glue water, and worked into paper; it can be nicely smoothed, and is said to resist a white glow heat.

3. The *Chemiker Zeitung* gives the following modes of preparing incombustible writing and printing paper, which appear worth attention: Asbestos is treated with a preparation of permanganate of potash and then with sulphuric acid; 95% of this asbestos is mixed with 5% of wood pulp in water containing borax and glue. A fireproof writing ink is made by mixing Indian ink and gum with chloride of platinum and oil of lavender; for printing ink, lampblack and varnish are to be substituted.

4. Paper made of pure asbestos resists a high temperature without material alteration. An ammoniacal solution of nitrate of silver, colored with a little Indian ink, will perserve a legible copy when written with on the asbestos paper mentioned above, and subjected to strong heat.

5. A free flowing ink for writing on fireproof paper with an ordinary metallic pen may be obtained by using 5 parts dry platinum chloride with 15 parts of oil of lavender, 15 parts of Chinese ink, and 1 part of gum arabic, adding thereto 64 parts of water When the paper is ignited after being written upon with this ink, the platinum ingedient causes the writing to appear transparent, and, as a consequence, it is claimed that such writing as has become black or illegible will become readily legible again during the process of heating the paper. Colors for painting may also be make fireproof by mixing commercial metallic colors with the chloride of platinum and painters' varnish, adding an ordinary aquarelle pigment to strengthen the covering power of the color These fireproof paints or colors can be easily used in the same manner as the common water colors, and it is claimed they will resist the destructive influence of great heat quite as successfully as the fireproof printing and writing inks just referred to.

Much useful information will be found in W. G. McMillan's paper on *Some Causes of Fire*

and Methods for their Prevention (Jl. Soc. Arts, vol. xxxii.)

Fireworks, Colored. See **Pyrotechny.**

Fish Lines, to Protect. See **Cleansing,** *Mildew.*

Fishing Line, to Waterproof. See **Waterproofing.**

Fish Lines, to Wax. See **Waxes.**

Fixing Agents. See **Microscopy.**

Fixing Baths. See **Photography.**

Fixing, Sensitizing and Toning. See **Photography.**

Flannel, to Bleach. See **Bleaching.**

Flannels, to Wash. See **Cleansing.**

Flash.—Burnt sugar coloring, 1 gal. fluid extract of capsicum or essence of Cayenne, ¾ pt., or enough to give a strong fiery taste. Used to color spirits and to give them a false strength.

Flash Light. See **Photography.**

Fleas, on Dogs and Other Animals.—Soap water, carbolic acid in dilute alcoholic solution, flowers of sulphur either used as a powder or mixed by agitation with water containing a little glycerine; dilute solutions of sulphate of magnesia—any powder or solution containing tannin, as dried sumac, tea and Persian insect powder. These are the least objectionable exterminators. A little of the carbolic solution may be mixed in with the soap water, and this used as a wash or sprinkled in infected localities. Flowers of sulphur contain sulphurous acid, which is fatal to the insect, but it must not be used on or near colored woolen fabrics, as it is liable to injure the colors. Sulphate of magnesia solution (in water) may be used as a wash. Sumac powder, etc., give excellent results. The sulphur mixture mentioned, or carbolic acid shaken up with about 20 parts of water, and sprinkled in the cellar, will soon depopulate the coal heap.

Fleas, to Rid Cellars of.—L. O. Howard recommends benzine. A safer method is to sprinkle the floor thickly with quicklime, or a good size bundle of fresh pennyroyal scattered over the floor will drive them out. If fresh pennyroyal is not obtainable get 2 oz. oil of pennyroyal, 2 oz. oil of sassafras, 4 oz. alcohol; shake together well in a bottle and spray around with an atomizer. Substitute sweet oil for alcohol, and the mixture rubbed on the hands and face will keep off mosquitoes.—*P. H. L.*

Fleckenwasser. See **Cleansing.**

Flies, to Destroy.—1. Take an infusion of quassia, 1 pt.; brown sugar, 4 oz.; ground pepper, 2 oz. To be well mixed together, and put in small shallow dishes where required.

2. Black pepper (powdered), 1 drm.; brown sugar, 1 drm.; milk or cream, 2 drm. Mix, and place it on a plate or saucer where the flies are most troublesome.

3. Pour a little simple oxymel (an article to be obtained at the druggists) into a common tumbler glass, and place in the glass a piece of cap paper, made into the shape of the upper part of a funnel, with a hole at the bottom to admit the flies. Attracted by the smell, they readily enter the trap in swarms, and by the thousands *soon* collected prove that they have not the wit or the disposition to return.

4. Take some jars, mugs, or tumblers, fill them half full with soapy water; cover them as jam pots are covered with a piece of paper, either tied down or tucked under the rim. Let this paper be rubbed inside with wet sugar, molasses, honey, or jam, or anything sweet; cut a small hole in the center, large enough for a fly to enter. The flies settle on the top, attracted by the smell of the bait; they then crawl through the hole, to feed upon the sweet beneath. Meanwhile the warmth of the weather causes the soapy water to ferment, and produces a gas which overpowers the flies, and they drop down into the vessel. Thousands may be destroyed this way, and the traps last a long time. See also **Paper,** *Fly.*

Floors, Cement for. See **Cements.**

Floors, Lacquer for. See **Lacquers.**

Floors, to Scour. See **Cleansing.**

Floors, to Wax. See **Waxes.**

Florida Water. See **Waters.**

Flour Paste. See **Pastes.**

Flour.—*How to Select.*—1. Look at its color. If it is white, with a slightly yellowish or straw colored tint, it is a good sign. If it is very white with a bluish cast, or with black specks in it, the flour is not good. 2. Examine its adhesiveness—wet and knead a little of it between the fingers; if it works dry and elastic, it is good; if it works soft and sticky, it is poor. Flour made from spring wheat, is likely to be sticky. 3. Throw a little lump of dry flour against a dry, smooth, perpendicular surface; if it adheres in a lump, the flour has life in it; if it falls like powder, it is bad. 4. Squeeze some of the flour in your hand; if it retains the shape given by the pressure that, too, is a good sign. Flour that will stand all these tests is safe to buy. These modes were given by old flour dealers, and we make no apology for printing them, as they pertain to a matter that concerns everybody, namely, the quality of that which is the staff of life.

Flour, Self-Raising.—The following are the compositions of several of these powders in extensive use: 1. Bicarbonate soda, 23 oz.; burnt alum, 19 oz.; starch, 57 oz. 2. Bicarbonate soda, 24¼ oz.; sesquicarbonate soda, 2¼ oz.; starch, 47 oz.; burnt alum, 2½ oz. 3. Bicarbonate soda, 31 oz.; burnt alum, 29½ oz.; starch, 39 oz.

Flowers, Mass for. See **Compositions.**

Flowers, Preservation of.—1. A method of preserving the natural colors of flowers, recommended by R. Hegler in the *Deutsche Botanische Monatsnefte,* consists in dusting salicylic acid on the plants as they lie in the press, and removing it again with a brush when the flowers are dry. Red colors in particular are well preserved by this agent. Another method of applying the same preservative is to use a solution of 1 part of salicylic acid in 14 of alcohol by means of blotting paper or cotton wool soaked in it and placed above and below the flowers. Powdered boracic acid yields nearly as good results. Dr. Schonland, in the *Gardeners' Chronicle,* recommends, as an improvement in the method of using sulphurous acid for preserving the color, that in the case of delicate flowers they might be placed loosely between sheets of vegetable parchment before immersion in the liquid, so as to preserve their natural form.

2. Insert their stems in water in which 25 grn. ammonium chloride (sal ammoniac) have been dissolved. Flowers can be preserved in this way for fifteen to thirty days. To preserve them permanently for several months dip them into perfectly limpid gum water and then allow them to drain. The gum forms a complete coating on the stems and petals, and preserves their shape and color long after they have become dry.

Flowers in Water.—Any kind of flower can be well preserved for at least two weeks by putting a little saltpeter or carbonate of soda in the water in which the flowers are left standing.

Flowers, Varnish for. See **Varnishes.**

Flowers, Wax, to Make. See **Waxes.**

Fluorescent Liquids. — The following table shows the characteristic colors of:

Substances.	Transmitted.	Reflected.
Quinine	Transparent and colorless	Pale blue.
Æsculine	Straw color.	Pale blue.
Amido-phthalic acid	Pale yellow	Pale violet.
Amido tere-phthalic acid	Pale green	Bright green.
Paviine	Pale green	Blue green.
Fluorescine	Orange red	Intense green
Eosin	Orange	Gamboge.
Rose of Magdala.	Carmine and clear.	Opaque scarlet.
Saffronin	Crimson	Dirty yellow.

Fluxes.—These articles being easy to fuse, are added to substances which are more refractory, to promote their fusion. Following is a list of the most common fluxes, with a brief account of their properties and uses:

1. *Ammonium Chloride* (AmCl), called sal ammoniac. This substance is decomposed by several metals forming metallic chlorides and liberating ammonia, which property is taken advantage of in purifying gold. A similar reaction occurs with several metallic salts.

2. *Sodium Chloride* (NaCl), or common salt, is employed for preserving the substance beneath from the action of the atmosphere, and to moderate the action of bodies which cause violent ebullition. It melts and volatilizes at a red heat in an open crucible, but requires a white heat to vaporize it in a closed vessel. When heated to redness with silica it forms a readily fusible silicate. It forms fusible compounds with antimony and arsenic, thus removing them from other metals during the process of refining. As the crystals decrepitate when heated, common salt should be powdered before using as a flux.

3. *Borax* ($B_4O_7Na_2$).—In the crystalline form it may contain 5 or 10 molecules of water, which are given off on heating, causing an enormous increase in volume, so that the vitrified form is much more suitable for assaying. It forms fusible compounds with silica and nearly all bases, being especially useful in uniting with metallic oxides, sulphides and arsenides. The commercial salt is adulterated with common salt and alum.

4. *Sodium Carbonate* (Na_2CO_3) has the property of oxidizing many metals, such as tin, iron, zinc, etc., by the action of its carbonic acid, and as a consequence of this action it acts as a desulphurizer. It forms fusible compounds with silica and many metallic oxides; it also melts at a low temperature, absorbing many infusible substances, such as lime, alumina, charcoal, etc. In some cases it acts as a reducing agent, as in the case of chloride of silver. When mixed with carbonate of potash a double salt is formed, which fuses at a lower temperature than either taken alone, a property very useful in the fusion of silicates, etc.

5. *Potassium Nitrate* (KNO_3), also called niter and saltpeter, is largely used as an oxidizing agent. It fuses below redness and at a higher temperature is decomposed, yielding a large volume of oxygen, whereby the sulphur of metallic sulphides is converted into sulphurous acid and the metals into oxides. Sodium nitrate acts in the same way.

6. *Potassium Bitartrate* (THoKo), known also as cream of tartar or tartar. When pure this substance is white, but the variety chiefly used on the large scale is colored and sold as red argol. This is cheaper, and contains other carbonaceous matters, which give it greater reducing power than pure cream of tartar. This reagent is very valuable in operations requiring much carbonaceous matter.

7. *Potassium Chlorate* ($KClO_3$).—This substance is sometimes used with niter as an oxidizing agent, especially in assaying.

8. *Potassium Cyanide* (KCN).—This flux is valuable on account of the facility with which it fuses and the readiness with which it reduces many metallic compounds when mixed with carbonate of soda. Common cyanide is preferable as a reducing agent, because it contains carbonate of potash.

9. *Calcium Oxide* (CaO) or lime is used in the caustic state, or combined with carbonic acid in the form of carbonate. It is a useful flux for silica and silicates, and is also used to remove sulphur and phosphorus from metals and their compounds.

10. *Calcium Fluoride* (CaF_2) or fluorspar. This substance acts as a flux in two ways: 1. By combining with silicates, forming fusible compounds. 2. By reacting with silicates and evolving the gas silicon fluoride SiF_4. It forms fusible compounds with sulphates, such as plaster of Paris, and with phosphate of lime (bone ash). It should be free from pyrites, blende and galena, with which it is likely to be contaminated.

11. *Lead Oxide.*—There are two oxides of lead of importance in treating metals, viz., litharge (PbO) and red lead (Pb_3O_4). Both oxides are reduced by carbon or hydrogen, producing metallic lead. Lead oxides, when melted, oxidize nearly all metals, except mercury, gold, silver and platinum. With other oxides they form easily fusible compounds. When heated with sulphur, lead oxides are reduced and sulphurous acid is liberated. When oxide of lead in sufficient quantity is melted with an infusible silicate, a fusible double silicate is formed.

12. *Manganese Dioxide* (MnO_2).—This substance is black in color, opaque and a good conductor of electricity. When heated alone it is infusible, but gives off oxygen, forming Mn_2O_3 or Mn_3O_4, according to the degree of heat employed; heated with charcoal it is reduced to MnO. The facility with which it gives up oxygen makes it a valuable oxidizing agent. With hydrochloric acid it is extensively used for generating chlorine. When strongly heated in a crucible lined with a paste of carbon it is reduced to the metallic state.

13. *Silica* (SiO_2).—This body occurs in crystalline and amorphous forms; it is white, infusible, except at the very highest temperatures, non-volatile, insoluble in water and acids, except hydrofluoric; after ignition it is decomposed by carbon in the presence of iron, copper or silver at a white heat, forming silicides of those metals. The amorphous and gelatinous varieties are slightly soluble in alkaline carbonates, but readily soluble in caustic alkalies. It combines with all the bases forming silicates, and is, therefore, frequently employed to effect the fusion and separation of gangues in ores, the best forms to use being pure white sand and quartz.

14. *China Clay* is essentially a hydrated silicate of alumina, and when pure may be represented by the formula $(2Al_2O_3, 3SiO_2) + 3OH_2$; but clay is generally mixed with other silicates. It is white and infusible in an ordinary furnace when heated alone, but readily unites with earthy and metallic gangues to form a fusible slag.

15. *Glass* is a mixture of silicates of sodium and potassium with some insoluble silicate: such as silicate of barium, magnesium, aluminum, iron or lead. Being a compound silicate, it fuses easily at a high temperature, and readily combines with lime and other bases containing little or no silica, so that it is often preferred to pure silica, and serves to economize borax. It is also employed as a covering in melting metals, so as to exclude the air. Plate or window glass, or green bottle glass, is the most useful, but flint glass, which contains much oxide of lead, would be detrimental in many cases.

16. *Ferrous Sulphide* (FeS) is chiefly used as a source of sulphureted hydrogen. Roasted with easily decomposable sulphides, such as that of silver, it converts them into sulphates. Heated with oxides of copper, nickel, etc., it

forms regulus. Heated in air it is oxidized to sulphate, and at a high temperature to oxide.

17. *Iron Pyrites* (FeS_2).—This body loses half its sulphur at a white heat, forming ferrous sulphide, and is used for similar purposes to that compound. It is chiefly employed in the metallurgy of copper, nickel and cobalt.

18. *Ferric Oxide* (Fe_2O_3).—This oxide is very stable, non-volatile, and of a red color. At a white heat it gives up oxygen, forming Fe_3O_4. By heating with carbon, or carbonic oxide, it is reduced to the metallic state, but if much carbonic acid is present, ferrous oxide may be formed, which combines with any silica present, forming a fusible silicate. For this reason it is sometimes used as a flux. In refining iron it acts as an oxidizing agent. In presence of sulphur it oxidizes that element to sulphurous acid.

19. *Zinc Oxide* (ZnO) is a powerful base; it forms combinations with alkaline earths and several bases, and has a strong affinity for alumina. It is reduced by carbon, carbonic oxide and hydrogen. Zinc oxide and carbon in small quantity is added to molten copper for producing sound castings.

The above synopsis of fluxes is due to Hiorn's valuable work, "Mixed Metals."

1. *Black Flux.*—Cream of tartar, 2 parts; niter, 1 part; powder, mix and deflagrate, by small quantities at a time, in a red hot crucible. This is merely carbonate of potash, mixed with charcoal in a finely divided state. It is used for smelting metallic ores, and exercises a reducing action, as well as promoting the fusion.

2. *White Flux, Cornish Refining Flux.*—Cream of tartar and niter, equal parts; deflagrate as last.

3. *Morveau's Reducing Flux.*—Powdered glass (containing no lead), 1 lb.; calcined borax, 2 oz.; powdered charcoal, 1 oz.; mix. Used for the same purposes as black flux.

4. *Cornish Reducing Flux.*—Cream of tartar, 10 oz.; niter, 4 oz.; borax, 3 oz.; mix.

5. *Crude Flux.*—Niter mixed with twice its weight of tartar, without deflagration. Reducing.

6. Borax, tartar, niter, sal ammoniac, common salt, limestone, glass, fluorspar, and several other substances are used as fluxes in metallurgy.

Flux for Reducing Arsenic.—Carbonate of soda in crystals, 8 parts; finely powdered charcoal, 1 part; heat gradually to a red heat.

Enamel Flux.—1. Eight parts red lead, 6 parts flint glass, 3 parts borax, 3 parts flint. 2. 7 parts red lead, 4 parts borax, 2¼ parts flint. 3. 4 parts borax, 3 parts red lead, 3 parts flint glass, 2 parts flint. 4. 3 parts red lead, 1 part flint glass, 1 part flint.

Gold Flux.—Eleven parts borax, 5½ parts litharge, 1 part oxide of silver. In these enamel fluxes the materials are to be made very fine, particularly the flint, and mixed well together, so that the particles may more easily concrete when in a state of fusion; then calcined in an air furnace or an earthenware glazing oven, when the whole mass, by means of the proper temperature of fire, will be changed into a brittle, resplendent and transparent glass.

Fluxes for Soldering or Welding.—

Iron or steel.....Borax or sal ammoniac.
Tinned iron.....Resin or chloride of zinc.
Copper and brass....Sal *ammoniac* or chloride of zinc.
Zinc.....Chloride of zinc.
Lead.....Tallow or resin.
Lead and tin pipes...Resin and sweet oil.

Flux for Soldering Zinc.—Dissolve small bits of zinc, or zinc drops, in muriatic acid, mixed with an equal bulk of water.

Fly Paper. See **Paper.**

Fly Specks, to Remove. See **Cleansing.**

Fly Poison.—1. A strong solution of white arsenic (say 1 drm. to the pt.) sweetened with moist sugar, molasses or honey. *Poison.*

2. Molasses, honey or moist sugar, mixed with about one-twelfth their weight of King's yellow or orpiment. Both the above are dangerous preparations, and should never be employed where there are children.

3. (Redwood) quassia chips (small), ¼ oz.; water, 1 pt.; boil ten minutes, strain and add of molasses, 4 oz. Flies will drink this with avidity, and are soon destroyed by it.

4. Black pepper, 1 teaspoonful; brown sugar, 2 teaspoonfuls; cream, 4 teaspoonfuls. *Fly* Powder. The dark gray colored powder (so called suboxide) obtained by the free exposure of metallic arsenic to the air. Mixed with sweets, it is used to kill flies. See also **Flies,** above.

Foils. (From feuille, Fr., or folium, Lat., a leaf.)—Thin leaves of polished metal, put under stones or pastes, to heighten the effect. Foils were formerly made of copper, tinned copper, tin and silvered copper, but the latter is that wholly used for superior work at the present day. There are two descriptions of foils employed, viz., white, for diamonds and mock diamonds, and colored, for the colored gems. The latter are prepared by varnishing the former. By their judicious use the color of a stone may be often modified. Thus, by placing a yellow foil under a green stone that turns too much on the blue, or a red one turning too much on the crimson, the hues will be brightened.

1. *White or Common Foil.*—This is made by coating a plate of copper with a layer of silver, and then rolling it into sheets in the flatting mill. The foil is then highly polished or varnished.

2. *Colored Foils.*—These are made by coloring the preceding foil, highly polished, with certain transparent solutions or varnishes. The following produce beautiful colored effects, when judiciously employed:

3. *Blue.*—Prussian blue (preferably Turnbull's) ground with pale, quick drying oil. Used to deepen the color of sapphires. It may be diluted with oil.

4. *Green.*—*a.* Pale shellac, dissolved in alcohol (lacquer) and tinged green by dissolving verdigris or acetate of copper in it. *b.* Sesquiferrocyanuret of iron and bichromate of potassa, of each ½ oz.; grind them with a stone and muller to a fine powder, add gum mastic (clean and also in fine powder) 2 oz.; grind again, add a little pyroxilic spirit, and again grind until the mass becomes homogeneous and of a fine transparent green; the beauty increases with the length of the grinding. The predominance of the bichromate turns it on the yellowish green; that of the salt of iron, on the bluish green. For use it is to be thinned with pyroxilic spirit. (Chemist, iii., 238.) This is used for emeralds. It may be brightened by adding a little yellow varnish.

5. *Yellow.*—*a.* Various shades of yellow may be produced by tinging a weak alcoholic solution of shellac or mastic, by digesting turmeric, annatto, saffron, or socotrine aloes therein. The former is the brightest and most fit for topazes. *b.* Digest hay saffron in five or six times its weight of boiling water, until the latter becomes sufficiently colored, filter and add a little solution of gum or isinglass. When dry, a coating of spirit varnish should be applied.

6. *Red.*—Carmine dissolved in spirits of hartshorn, or a weak solution of salt of tartar, and gum added as above.

7. *Garnet.*—Dragon's blood dissolved in rectified spirit of wine.

8. *Vineyer Garnet.*—Orange lake finely tempered with shellac varnish.

9. *Amethyst.*—Lake and Prussian blue finely ground in pale drying oil.

10. *Eagle Marine.*—Verdigris tempered in shellac varnish (alcoholic,) with a little Prussian blue.

11. *Ruby.*—*a.* Lake or carmine, ground in isinglass. *b.* Lake ground in shellac varnish. Used when the color turns on the purple. *c.* Bright lake ground in oil; used when the color turns on the scarlet or orange.

12. *Diamond.*—*a.* Cover the inside of the socket in which the stone or paste is to be set with tin foil, by means of a little stiff gum or size; when dry, polish the surface, heat the socket, fill it with warm quicksilver, let it rest for two or three minutes, then pour it out and gently fit in the stone; lastly well close the work round the stone, to prevent the alloy being shaken out. *b.* Coat the bottom of the stone with a film of real silver, by precipitating it from a solution of the nitrate in spirits of ammonia by means of the oils of cassia and cloves. Both these methods vastly increase the brilliancy both of real and factitious gems.

Fomentation.—A liquid, either simple or medicated, used for local bathing. Fomentations are distinguished from lotions chiefly in being applied in a heated state and in larger quantities and for a longer period at a time. Fomentations are chiefly employed to allay pain or irritation, or to promote suppuration, or the healthy action of the parts.

Dried mallows, 2 oz.; chamomile flowers, dried, 1 oz.; 1 qt. water, boiled for twenty minutes and strained.

Foot Powders. See **Powders.**

Fossils, to Take Casts of.—Clear the edges of the fossil of the limestone, etc., it may be imbedded in and paste all round its circumference a piece of smooth note paper, thus making a mould, say half an inch deep. Before, however, pasting the paper, well blacklead the surface of fossil and rub it with grease. Then, after pasting, pour into mould some melted wax, sufficient to make a mould, say half an inch thick. When cool remove the paper and wax, trim up if ragged in any part, and then paste another piece of paper around the wax, making the mould to receive the plaster of Paris for casts. The plaster of Paris should be very fine, and should be mixed with water containing a little albumen, then poured into mould and allowed to harden, afterward removing and sharpening up with a fine pointed needle. The cast may now be painted, so as to imitate original fossil.

Foundry Recipes:

1. Fire clay crucibles, 2 Stourbridge clay, 1 hard gas coke, finely powdered.
2. Berlin crucibles, 8 Stourbridge clay, 3 old crucibles, ground finely, 5 coke, 4 graphite or blacklead.
3. Blacklead crucibles. 1 fire clay, 2 graphite.

See also **Crucibles** above.

Frames, Gold Varnish for. See **Varnishes. To Gild.** See **Gilding.**

Frames, to Renovate. See **Cleansing.**

Frankfort Black. See **Pigments,** *Black, Frankfort.*

Frankincense.—The turpentine which exudes from the bark of Abies excelsa (Norway spruce fir), and Pinus palustris (pitch or swamp pine), hardenened by the air. The gum resin olibanum, which is the produce of the Boswellia thurifera, is the odorous frankincense of commerce.

Prepared Frankincense.—Frankincense, 1 lb.; water, q. s. to cover it; boil until the resin is melted, and strain through a hair sieve; when the whole has cooled pour off the water, and keep the frankincense for use. Resembles common resin in its general properties.

Freckles. See **Cosmetics.**

Freezing Mixtures. See table on page 225.

French Berries.—Persian berries. The berries or fruit of the Rhamnus infectorius. They are imported from France and Persia; those from the latter country being esteemed the best. Their decoction dyes cloth, mordanted with alum, tartar, or protomuriate of tin, of a yellow color; with sulphate of copper, an olive, and with red sulphate of iron, an olive green color.

French Chalk.—Steatite or talc. It is much used in the arts.

French Polish. See **Polishing,** *Wood,* French.

Friction.—The ratio obtained by dividing the entire force of friction by the normal pressure is called the coefficient of friction, hence we may define the unit or coefficient of friction to be the friction due to a normal pressure of one pound:

Iron on oak	0·62
Cast iron on oak	0·49
Oak on oak, fibers parallel	0·48
Oak on oak, greased	0·10
Cast iron on cast iron	0·15
Wrought iron on wrought iron	0·14
Brass on iron	0·16
Brass on brass	0·20
Wrought iron on cast iron	0·19
Cast iron on *elm*	0·19
Soft limestone on the same	0·64
Hard limestone on the same	0·38
Leather belts on wooden pulleys	0·47
Leather belts on cast iron pulleys	0·28
Cast iron on cast iron, greased	0·10

Pivots or axes of wrought or cast iron, on brass or cast iron pillows:

First, when constantly supplied with oil	0·05
Second, when greased from time to time	0·08
Third, without any application	0·15

Friction Matches. See **Matches.**

Frilling. See **Photography.**

Fritt.—For making glazes many substances would be unfitted on account of being soluble in water, but if these substances, such as borax, soda or niter are fused into a glass, this glass can be run into water, thus breaking it up into fragments. This is called a fritt. The fritt is now pulverized and mixed with other materials and water.

Frost Bites.—For frost bites rub the affected parts with pure oil of peppermint. It will also prevent the after effect of chilblains. Care should be taken to use only the pure oil, and not the essence of peppermint, as the essence will not have the desired effect.

Frosting of Cutlery, etc.—By etching the polished surface with acid. The articles are first heated to about 212°, then a thin coat of beeswax is melted over their surface, and when this cools the design is scratched through the wax by a needle, the acid is then poured on the design, and may be prevented from falling off by a little wall of wax built around the design. Muriatic acid answers very well for etching. The time required for the operation is best found by a little practice, as the fine lines of the design take more time to etch than is required for the coarse ones. When it is decided that the etching is complete, with clean cold water thoroughly wash away all traces of acid and then with a little benzine remove the wax and polish with clean, dry chamois leather.

Frosting Glass. See **Glass.**

Frosting and Whitening of Silver Goods, Pickle for.—Sulphuric acid, 1½ drm.; water, 6 oz. Heat and immerse the silver until frosted as desired. Wash well, dry with a soft linen cloth or in fine sawdust. For whitening only, use less acid. See also **Silver.**

Freezing Mixtures.

	Mixtures.	Thermometer sinks: ° F.		Actual Reduction of Temperature: ° F.
1.	Two parts snow or pounded ice, 1 part sodium chloride	from any temperature.	° to — 5	°
2.	Five parts snow or pounded ice, 2 parts sodium chloride, 1 part ammonium chloride		" to —12	"
3.	Twenty-four parts snow or pounded ice, 10 parts sodium chloride, 5 parts ammonium chloride, 5 parts potassium nitrate		" to —18	"
4.	Twelve parts snow or pounded ice, 5 parts sodium chloride, 5 parts ammonium nitrate		" to —25	"
5.	Three parts sodium phosphate, 2 parts ammonium nitrate, 4 parts diluted mixed acids		from —34 to —50	16
6.	Eight parts snow, 10 parts dilute sulphuric acid		" —68 to —91	23
7.	One part snow, 3 parts crystallized calcium chloride		" —40 to —73	33
8.	Five parts sodium phosphate, 3 parts ammonium nitrate, 4 parts dilute nitric acid		" 0 to —34	34
9.	One part ammonium nitrate, 1 part water		" 40 to 4	36
10.	Five parts ammonium chloride, 5 parts potassium nitrate, 16 parts water		" 50 to 10	40
11.	One part snow, 1 part dilute sulphuric acid		" —20 to —60	40
12.	Three parts snow, 2 parts dilute nitric acid		" 0 to —46	46
13.	Eight parts snow, 3 parts dilute sulphuric acid, 3 parts dilute nitric acid		" —10 to —56	46
14.	Five parts ammonium chloride, 5 parts potassium nitrate, 8 parts sodium sulphate, 16 parts water		" 50 to 4	46
15.	Five parts sodium sulphate, 4 parts dilute sulphuric acid		" 50 to 3	47
16.	Three parts sodium nitrate, 2 parts dilute nitric acid		" 50 to — 3	53
17.	Two parts snow, 3 parts calcium chloride		" —15 to —68	53
18.	Three parts snow, 2 parts dilute sulphuric acid		" 32 to —23	55
19.	One part ammonium nitrate, 1 part sodium carbonate, 1 part water		" 50 to — 7	57
20.	Eight parts snow, 5 parts hydrochloric acid		" 32 to —27	59
21.	Six parts sodium sulphate, 4 parts ammonium chloride, 2 parts potassium nitrate, 4 parts dilute nitric acid		" 50 to —10	60
22.	Nine parts sodium phosphate, 4 parts dilute nitric acid		" 50 to —12	62
23.	Seven parts snow, 4 parts dilute nitric acid		" 32 to —30	62
24.	One part snow, 2 parts crystallized calcium chloride		" 0 to —66	66
25.	Three parts snow, 4 parts calcium chloride		" 20 to —48	68
26.	Four parts snow, 5 parts calcium chloride		" 32 to —40	72
27.	Two parts snow, 3 parts crystallized calcium chloride		" 32 to —50	82
28.	Three parts snow, 4 parts potash		" 32 to —51	83
29.	Six parts sodium sulphate, 5 parts ammonium nitrate, 4 parts dilute nitric acid		" 50 to —40	90

Frosty Windows. See **Windows, Frosty.**

Fruit Acid.—Citric acid, 12 oz.; pure water, 12 oz. Used for flavoring and for sirups.

Fruit Cans, Cement for. See **Cements.**

Fruit to Crystallize.—The following process may meet the requirements: Make a sirup from 1 lb. of sugar and ½ pt. of water, stir until the sugar is dissolved, then boil quickly about three or four minutes. Try by dipping a little in cold water. If it forms a small ball when rolled between the thumb and finger it has attained the desired degree, known as the ball. Throw the fruit to be conserved a little at a time into this sirup, let it simmer for a moment, lift with a skimmer, draining free from all sirup. Sprinkle sugar thickly over boards or tin pans, place the fruit over it in a single layer, sprinkle over thickly with granulated sugar and place in the oven or sun to dry. When dry, make a sirup as before, and just before it reaches the ball degree add the fruit, stir with a wooden spoon until it begins to grain and sticks to the fruit. When cold, sift off the sugar and put out again to dry. When dry, place in boxes in layers between sheets of waxed paper. Keep in a cool, dry place. See also *Preserving.*

Fruit Essences. See **Essences.**

Fruit Flavorings.—I give instructions by which all confectioners may extract and preserve their own fruit essences, and so guard the health and add to the pleasure of all for whom they provide. Among the juicy fruits are strawberries, raspberries, blackberries, cherries and currants; among non-juicy fruits are the apples, pears, peaches, quinces, apricots, and plums.

Mash the juicy fruits in a basin to a pulp. Place on the fire and make scalding hot. Now pour into a hair sieve and allow the juice to strain through. Put into bottles and securely tie down. Place these bottles in a caldron of cold water and boil for twenty minutes. Remove from the fire and allow to remain in the caldron until cold. Then set away for use

In the case of non-juicy fruits, such as apples, pears, peaches, etc., put the fruit into a basin. Cover with water and boil to a pulp. Now place on a hair sieve and allow to drain without any pressing. Observe now that it is only the liquor which passes through the sieve without pressing which is to be used for flavoring purposes. What remains in the form of pulp is not adapted for these uses. Now put the juice obtained as above into bottles, and proceed to treat as already laid down for the juicy fruits.

The foregoing processes are to be gone through with in the case where the extracts are to be kept transparent and clear, as for sirups, cordials and beverages.

In case where the flavorings are to be used for any purpose where transparency or clearness is not desirable, such as for ice creams, fruit ices, or bonbons, then I would use not only the clear fluid, but the pulp of the fruit also. I would for these opaque purposes save and utilize everything of the fruit except the skins and seeds. This pulp is to be treated as already laid down.

As thus obtained and preserved our confectioners can supply themselves with a quantity of perfectly pure extracts of all their favorite fruits, and which can always be at hand, for flavoring every description of pastry, cakes, pies, tarts, puddings, creams, ices and beverages, and at any season of the year. Especially when there is any one in the house who is sick or feverish, cordials may be flavored with these delightful sub-acids—these remedies and restoratives of kind mother Nature herself—such as will shoot through all the veins of the most debilitated and infirm the most delicious sensations of happiness and hope.—*James W. Parkinson, in Confectioners' Journal.*

Fruit Salt.—(1.) 2 oz. carbonate soda, 2 oz. tartaric acid, 2 oz. cream tartar, 2 oz. Epsom salts, 2 oz. sifted sugar. Dry the salts in the oven, and beat fine; then mix the whole well together and keep in a dry place. The above forms a useful family aperient.

2. Is composed of carbonate of soda, citric acid, fine white sugar and powdered ginger. It makes a pleasant drink and is an excellent antagonist to indigestion. Ginger is a carminative, and the carbo ate of soda destroys the acidity which occasions flatulency. Lamplough's pyretic saline is a mixture of carbonate of soda and tartaric acid, with 2% potassium chlorate.

3. Carbonate of soda, 4 oz.; citrate of magnesia, 4 oz.; tartaric acid, 2½ oz.; cream of tartar, 2 oz.; Epsom salts, 1 oz. The salts and soda to be well dried, and the whole well mixed in mortar with pestle.—*W. B.*

Fuchsine or Fuschine.—One of the red coloring matters obtained from aniline, generally included under the common name—magenta.

Fuel, Economical.—Mix coal, charcoal, or sawdust, 1 part; sand of any kind, 2 parts; marl or clay, 1 part; in quantity as thought proper. Make the mass up wet into balls of a convenient size, and when the fire is sufficiently strong place these balls, according to their size, a little above the bar, and they will produce a heat considerably more intense than common fuel, and insure a saving of one-half the quantity of coals. A fire thus made up will require no stirring nor fresh fuel for ten hours.

Fuller's Earth.—A soft marl used by fullers and others in cleansing fabrics.

Fulminating Powder.—*Prep.*—Niter, 3 parts; carbonate of potash, 2 parts; flowers of sulphur, 1 part; dry, and reduce them separately to fine powder, then carefully mix them. About 20 or 25 grn. slowly heated on a shovel over the fire, first fuses and becomes brown, and then explodes with a deafening report.

Fulmination and Fulminates.—*Syn.* Fulminatio (*Lat.*). Fulmination (*Fr.*, from *fulmen*, a thunderbolt). Detonation. The term is applied in chemistry to the violent explosion of a fulminate.

Fulminate of Silver.—Dissolve 10 grn. of pure silver at a gentle heat in 70 minims of ordinary concentrated nitric acid, sp. gr. 1·42, and 50 minims of water. As soon as the silver is dissolved the heat is removed, and 200 minims of alcohol, sp. gr. 0·87, are added. If the nitric acid and alcohol are not of the exact strength here given, it may be difficult to start the action, in which case add two or three drops of red nitric acid, which contains nitrous acid. Standard silver containing paper may be used for the preparation of the fulminate. If the action does not commence after a short time, a very gentle heat may be applied until effervescence begins, when the fulminate of silver will be deposited in minute needles, and may be further treated as in the case of fulminate of mercury. As the fulminate of silver is exploded much more readily than the fulminate of mercury, it must be handled with the greatest caution when dry. It should be separated into small quantities, each portion wrapped in paper, and kept in a cardboard box; nothing harder than this should be brought in contact with it. This mixture is of no use for percussion caps, being too violent in its action.

Throwdown Detonating Cracker.—Screw up a particle of fulminate of silver in a piece of thin paper, with some fragments of a crushed quartz pebble.

Double Fulminate of Silver and Ammonia.—Dissolve fulminate of silver in warm ammonia; the solution, on cooling, will deposit crystals of the double fulminate. This is very violent in

its explosion, and is dangerous while still moist.

Fulminating Platinum.—Dissolve binoxide of platinum in diluted sulphuric acid; mix the solution with excess of ammonia; a black precipitate is obtained, which detonates violently at about 400° F.

Fulminating Gold.—Add ammonia to a solution of terchloride of gold; the buff precipitate which it deposits is violently explosive at a gentle heat.

Terchloride of Gold.—Dissolve gold in hydrochloric acid with one-fourth of its volume of nitric acid. Evaporate on a water bath to a small bulk; when cool, yellow prismatic crystals of a compound of the terchloride, with hydrochloric acid are deposited, from which the hydrochloric acid may be expelled by a gentle heat, not exceeding 250° F. The terchloride forms a red brown deliquescent mass, which dissolves very readily in water.

Fumigation.—1. The diffusion of gaseous matter or vapors through the atmosphere, for the purpose of destroying contagion and infection. 2. The exposure of solid bodies to such fumes or vapors to remove the miasm of contagion from their pores. See also **Disinfectants.**

Fumigating Paper. See **Paper.**

Fumigating Pastils. See **Pastils.**

Fuming (Paper). See **Photography.**

Furniture, to Take Bruises Out of.—Wet the part with warm water; double a piece of brown paper five or six times, soak it in warm water, and lay it on the place; apply on that a warm, but not hot, flat iron till the moisture is evaporated. If the bruise be not gone, repeat the process. After two or three applications, the dent or bruise will be raised to the surface. If the bruise be small, merely soak it with warm water, and hold a red hot iron near the surface, keeping the surface continually wet—the bruise will soon disappear.

Furniture Cream.—1. Yellow wax, 4 oz.; yellow soap, 2 oz.; water, 50 oz.; boil, with constant stirring, and add boiled oil and oil of turpentine, each 5 oz.

2. Soft water, 1 gal.; soap, 4 oz.; white wax, in shavings, 1 lb. Boil together, and add 2 oz. of pearlash. To be diluted with water, laid on with a paint brush, and polished off with a hard brush or cloth.

3. Wax, 3 oz.; pearlash, 2 oz.; water, 6 oz. Heat together, and add 4 oz. of boiled oil and 5 oz. of spirits of turpentine.

White Furniture Cream.—Raw linseed oil, 6 oz.; white wine vinegar, 3 oz.; methylated spirit, 3 oz.; butter of antimony, ½ oz.; mix the linseed oil with the vinegar by degrees, and shake well so as to prevent separation; add the spirit and antimony, and mix thoroughly.

Furniture Oil.—Linseed oil, 4 oz.; vinegar, 2 oz.; mucilage, oil of turpentine, alcohol, ¼ oz. each; butter of antimony, ½ oz.; hydrochloric acid, ½ oz.; or linseed oil, 4 fl. oz.; oil of turpentine, 2 oz.; alcohol, 2 oz.; resin, 1 oz.; rose pink, ¼ oz.

2. Boiled linseed oil, 1 pt.; yellow wax, 4 oz.; melt, and color with alkanet root.

2. Acetic acid, 2 drm.; oil of lavender, ½ drm.; rectified spirit, 1 drm.; linseed oil, 4 oz.

4. Linseed oil, 1 pt.; alkanet root, 2 oz.; heat, strain and add lac varnish, 1 oz.

5. Linseed oil, 1 pt.; rectified spirit, 2 oz.; butter of antimony, 4 oz.

Oil for Darkening Furniture.—1. One pt. linseed oil; 1 oz. rose pink, and 1 oz. of alkanet root, beaten up in a metal mortar; let the mixture stand for a day or two; then pour off the oil, which will be found of a rich color. Or mix 1 oz. of alkanet root with 4 oz. of shellac varnish, 2 oz. of turpentine, the same quantity of scraped beeswax, and 1 pt. of linseed oil; this should stand a week.

Furniture Paste.—1. To keep wood light, scrape ¼ lb. beeswax into ½ pt. of turpentine. By adding linseed oil the wood is darkened.

2. Dissolve 6 oz. pearlash in 1 qt. of hot water, add ¼ lb. of white wax, and simmer for half an hour in a pipkin; take from off the fire, and when cool the wax will float, which should be taken off, and, with a little hot water, worked into a paste.

3. Beeswax, spirits of turpentine and linseed oil, equal parts; melt and cool.

4. Beeswax, 4 oz.; turpentine, 10 oz.; alkanet root to color; melt and strain.

5. Digest 2 drm. of alkanet root in 20 oz. of turpentine till the color is imparted; add yellow wax in shavings, 4 oz.; place on a water bath and stir till the mixture is complete.

6. Beeswax, 1 lb.; linseed oil, 5 oz.; alkanet root, ½ oz.; melt, add 5 oz. of turpentine, strain and cool.

7. Beeswax, 4 oz.; resin, 1 oz.; oil of turpentine, 2 oz.; Venetian red to color.

8. One lb. of white wax; 1 oz. black resin; 1 oz. alkanet root, and 10 oz. linseed oil.

Furniture Polish. See **Polishing,** *Wood.*

Furniture Renovator.—Mix together 2 lb. oil of amber (refined); olive oil, 2 lb.; tincture of henna, 2 oz. Apply with a rag.

Furniture Reviver.—Pale linseed oil, raw, 10 oz.; lac varnish and wood spirit, of each 5 oz. Mix well before using.

Furniture, to Restore. See **Cleansing.**

Furniture, Varnish for. See **Varnishes.**

Furs, to Clean. See **Cleansing.**

Furs and Skins, to Preserve. See also **Tanning.**—1. To preserve skins of any kind. First stretch them out on a board with tacks as soon as taken from the body; then cover them with wood ashes; let them remain a fortnight, and renew the ashes every three days.

2. The following soap is recommended by Ward, of London: The skins must be well scraped and divested of all fat, and well rubbed with the soap; 1 lb. yellow soap, 1 oz. lime, 1 oz. camphor, 1 oz. arsenic, 1 oz. alum; mixed together.

3. Sublimed sulphur and nitrate of potash, of each 2 drm.; black pepper, camphor, bichloride of mercury, burnt alum, and tobacco, of each ½ oz.; reduce to a fine powder.

4. Bichloride of mercury, 1 oz.; hydrochloric acid, 3 drm.; methylated spirit of wine, add to, 2 oz. Use as follows: Pour sufficient into a cup, and paint it freely on with a brush, especially about the cavities of the skull, the arms, wings, and thighs. A liberal supply of the powder (No. 3) afterward to the same parts will insure their keeping any length of time (that is, if you have any doubt about their keeping). If you would prefer it, you may use the powder alone.

5. To preserve and render the skins of moles soft and pliant soak them for three or four days in water which has had oak sapling bark boiled in it for two or three hours. To 2 qt. water put a good double handful or more of oak bark, or, better still, oak galls, and when this has got cold, put the mole skins in, fresh flayed. They will dry soft and pliant, and perfectly cured.

6. Nothing is required to preserve mole skins but drying. Skin them neatly, turn them inside out, hang to dry, turn them when dry, and scrape them with a blunt knife.

Fusel Oil.—*Fousel Oil, Potato Oil, Oil of Potato Spirit, Grain Oil, Grain Spirit Oil, Marc Brandy Oil, Crude Hydrated Oxide of Amyl.*—An offensive strong smelling oil, produced along with alcohol during the fermentation of grain, potatoes, etc., on the large scale, and which gives the peculiar and disagreeable flavor and odor to raw whisky. It is found chiefly in the last portion of the spirit which passes

over, called the faints, to which it imparts its characteristic odor and flavor. By rectifying the faints at a very gentle heat, most of the alcohol and water first pass over together with only a little fusel oil, while the latter forms the residuum in the still.

Fusible Metals. See **Alloys.**

Fustic.—A species of mulberry; it is extensively used in dyeing.

Fusion.—The liquefaction of solid bodies by the action of heat. The term aqueous fusion has been applied to the melting of salts in their water of crystallization; and the term igneous fusion to the liquefaction of bodies by heat alone.

Gallipot.—A Frengh term for that portion of turpentine which gathers on the trunk of the tree when wounded, and is removed in the winter

Gall.—Ox gall, the bile of an ox. It is of great use in removing spots, etc.

Gall, to Decolorize.—To a pint of gall, boiled and skimmed, add 1 oz. of alum and leave the mixture on the fire until the alum is dissolved. When cold pour into a bottle and cork loosely. Next treat another pint of gall in the same way, only substituting salt for alum. In about three months these preparations will deposit a sediment, then decant the fluid portion and mix them. A precipitate is immediately formed, which takes down the coloring matter and the fluid portion is removed.

Ox Gall, to Clarify.—Let the gall of a newly killed ox settle for twelve hours; pour off the liquor and boil until somewhat thick. Then spread it upon a dish until almost dry; place in jelly pots covered with paper. When desired for use dissolve a small piece in a tablespoonful of water.

Gall Nuts.—The so-called gall nuts are not, as commonly supposed a fruit, but a diseased growth produced upon the twigs of a dwarf oak, Quercus infectoria, when irritated by the eggs of the gall wasp, Cynips gallæ tinctoriæ. The part of the branch where the egg is deposited swells into a round nutlike mass, within which the larvæ of the insect grows and undergoes its metamorphosis. The tannin contained in the gall nut is not only larger in amount than in most other natural sources of this principle, but is of finer quality. Hence they are selected as the best material for the preparation of pure tannin.

Galvanizing.—1. For galvanizing cast iron with zinc, first clean the castings thoroughly by immersing in a bath of 1 part muriatic acid, 2 parts water, for a few hours; wash thoroughly in hot water and scrub with brush and sand. Then dip in a solution of sal ammoniac and water, ½ lb. to the gal., hot. Dry quickly and dip in the zinc bath.

2. To galvanize sheet iron work, dip in a bath of muriatic acid 1 part, water 4 parts; leave the work in long enough to break up the scale; clean with brushes or scrapers so that the surfaces shall be free from scale or dirt. Then dip in a fresh bath of muriatic acid and water, 1 to 4, with about 1 oz. sal ammoniac to the gal. of solution. Then dry quickly and thoroughly in a hot oven or on hot plates of iron and dip in the zinc bath. Never dip if any moisture remains among laps or rivets, for an explosion will ensue. Heat the zinc so that it will have a clear shining surface. Sprinkle a little powdered sal ammoniac upon the surface to clear it. Skim away the dross.

3. Clean all scale, rust and dirt or oil from the surface, and if oily, by boiling in caustic soda, and then remove scale and rust by a bath of hydrochloric acid and water. If necessary a little scrubbing with a metallic brush, and then thoroughly rinse in hot water and dry quickly. After drying immerse in a bath of melted zinc, at the same time sprinkle a little powdered sal ammoniac upon the surface of the melted zinc to clear it. Judgment is required as to length of time for the immersion and temperature of the melted zinc. Very small work immersed but a few seconds.

Galvanized Iron, Crystals on.—Clean it perfectly with a solution of chloride of zinc, and you will find that the coating is already crystalline. Or use a wash of dilute nitric acid, 1 of acid to 1 of water, and wash in a stream of clean water

Gamboge.—A gum resin which exudes from trees in Ceylon; 85% is soluble in alcohol.

Gangue.—Is a term applied to the earthy matter of iron and other ores. It consists chiefly of clay.

Ganister.—A refractory material used for the lining of Bessemer converters, and of steel moulds. It consists of a highly siliceous material cemented with fire clay, the silica equaling about 90%.

Ganteine. See **Cleansing.**

Gargle.—A gargle, or wash for the throat. Gargles are applied by allowing a small mouthful to run as much as possible over the affected parts, by holding the head backward, and breathing through it, by which means the liquid is agitated and its action promoted. They should not be swallowod.

1. For a very mild one use salt and water; for a more effective one use about 1 drm. chlorate of potash in 2 oz. water, or ½ to 1 oz. alum in 1 pt. water sweetened with honey. The chlorate of potash gargle must be used with care, as it is poisonous.

2. *Gargle for Sore Throat.*—

Tinct. guaiciammon	3 drm.
Liquor potassæ	3 drm.
Tinct. opii	2 drm.
Aq. cinnamoni	8 oz.

Gas.—*Hints to Gas Consumers.*—1. Always keep a plan of pipes and burners. It will frequently be useful.

2. Keep bell wires away from gas pipes.

3. Do not use a candle or open light in examing meters.

4. In case of serious leak, close main cock, open the windows, and locate the leak. Never sleep in any room where there is even a faint odor of gas.

5. If a gas flame goes out suddenly, it may be owing to water in the pipes, a frozen meter, or air in the pipes. An unsatisfactory flame may be owing to an obstruction of the burner or pipes.

6. To thaw out a frozen gas meter, use hot water or hot sand bags.

7. If gas lights bob up and down or flicker, it is a sign of water in the pipes. Remove the water, if possible, or notify the gas company.

8. A roaring or hissing sound indicates too much pressure; use a governor burner or partially close the stop cock to meter.

9. Never keep a gas flame turned down low in a bedroom. The air will become vitiated, owing to imperfect combustion. Also the flame may be extinguished by variations in pressure. See that all gas keys have pinstops, and that the fittings are tight.

10. In using rubber tube connections, always turn off the gas from above when leaving, as gas will in time leak through the tube.

11. To reduce the bills, have tight fittings, a pressure regulator, and examine the meter frequently.—Abridged from *Builder, Decorator and Woodworker.*

Gas Fixtures, to Bronze. See **Bronzing.**

Gas, Detection of Leakage.—Dr. Bunte's method for detecting gas leakage by means of palladium paper has been rendered still more delicate by Herr Schauffiers, who uses, to every three parts of chloride of palladium, one part of chloride of gold. The increase of sensitiveness may be partly due to catalytic action, that is,

to the mere presence of the gold, perhaps to the action of traces of acetylene upon the gold solution. The solution used for making the paper contains 3/8% of chloride of palladium and 1/8% of chloride of gold. One pt. costs about 9s. and will steep filter paper enough for 8,000 to 11,000 tests. The main sources of error are tobacco smoke, stoves and smoky chimneys, which let carbonic oxide into the room, the vapor of fusel oil, onion smell, mercury vapor and sulphureted hydrogen.

To Prevent Gas Meters from Freezing.—Add glycerine to the water in the proportion of ½ pt. to a gallon of water. Glycerine does not affect the metals of which the meter is composed.

To Detect a Leak in a Gas Pipe.—Rub a little soap water upon the suspected place. The formation of a bubble will show where the leak is.

Gas Pipe, Strength of.—The thread on a 3/8 inch gas pipe will sustain a weight of 5,000 lb., ½ inch, 7,000 lb. and ¾ inch 9,000 lb., so that chandeliers cannot readily be shaken from their supports.

Gases and Vapors, Refraction of.—(M. Mascart).—The new results obtained by the author are:

	Refraction with Relation to that of Air.
Chlorine	2·63
Bromine	3·85
Hyprochloric acid	1·52
Hydrobromic acid	1·95
Hydriodic acid	3·10
Hydrocyanic acid	1·49
Sulphydric acid	2·12
Ammonia	1·29
Water	0·88
Phosphorus protochloride	5·92
Carbon sulphide	5·05

Gasoline.—About 166 ft. of gas can be made from a gallon of gasoline.

Gas Tar.—This commonly called coal tar.

Gazogene.—A portable apparatus for aerating water and other liquids. Many forms have been given to this instrument, but in all the principle is the same. Powders for generating carbonic acid gas are placed in a separate compartment and the liquid to be aerated in another. The two compartments are connected by a suitable tube, and a second tube furnished with a spring tap affords an exit for the aerated liquid. The following are the proportions of soda and acid required for charging gazogenes:

1. For 2 pt., powdered tartaric acid, 280 gr.; bicarbonate of soda, 340 gr.

2. For 3 pt., powdered tartaric acid, 340 gr.; bicarbate of soda, 420 gr.

3. For 5 pt., tartaric acid, 620 gr.; carbonate of soda, 760 gr. Put the acid and soda in different colored papers.

Gearing, Simple Rules on.—The following rules will apply to both bevel and spur gears. When the term pitch is used, it always signifies diametrical, not circular pitch. For illustrations we will use gears having 64 teeth and 8 pitch.

To Find Pitch Diameter.—Divide the number of teeth by the pitch: 64 ÷ 8 = 8 in. pitch diameter.

To Find Number of Teeth.—Multiply the pitch diameter by the pitch: 8 in. × 8 = 64, number of teeth

To Find the Pitch—Divide the number of teeth by the pitch diameter: 64 ÷ 8 in. = 8, pitch.

To Find Outside Diameter of Spur Wheels.—Add 2 to the number of teeth and divide by the pitch: 64 + 2 = 66 ÷ 8 = 8¼ in. O. D.

To Find Circular Pitch.—Divide the decimal 3·1416 by the diametrical pitch: 3·1416 ÷ 8 = 0.3927 in.

To Find the Distance between the Centers of Two Spur Gears.—Divide half the sum of the teeth of both gears by the pitch: 64 + 64 = 128 ÷ 2 = 64 ÷ 8 = 8 in centers.

A simple rule to determine the face of bevel gears is to make them seven times the pitch; 8 pitch bevel will thus be 7/8 in. face.

Gelatin or Gelatine.—Animal jelly, obtained by the prolonged action of boiling water on the organic tissue of the bones, tendons and ligaments, the cellular tissue, the skin and the serous membranes. Glue and size are coarse varieties of gelatin, prepared from hoofs, hides, skins, etc., and isinglass is a purer kind, obtained from the air bladders or some other membranes of fish.

Gelatine, Bichromated.—Make a hot saturated solution of bichromate of potash in water, and in another vessel make a strong solution of gelatin. Then pour them together, stir well and allow to cool. The proportion of bichrome solution which is added varies according to the use. On exposure to the light it becomes insoluble, which is useful in many ways.

Gelatine Manufactured from Seaweed.—The seaweed, called by the native name of tengusa, is carefully washed and afterward boiled, so as to form a gluish decoction, which is strained off and put into square boxes. When cool it forms a stiff jelly, which can easily be divided into squares a foot in length. The manner in which the surplus water is removed is very ingenious. The jelly prisms are exposed in the open air during a cold night and allowed to freeze. During the day the sun melts the water, which runs off, leaving behind what one might term the skeleton of white, horny substance, which is extremely light and easily dissolved in hot water; when cooled, it again forms a stiff jelly. This article can be applied to many purposes—for culinary uses, for making bonbons and jellies, for clarifying liquids, as a substitute for animal isinglass, for making moulds used by the plaster of Paris workers, for hardening the same material, in short, as a substitute for all kinds of gelatines, over which it has the advantage of producing a firmer jelly.

Gelatine Sheets.—Dissolve fine glue or isinglass in water so that the solution when cold may be consistent. Pour it hot on a plate of glass (previously warmed with steam and slightly greased) fitted in a metallic frame whose edges are just as high as the wafer should be thick. Lay on the surface a second glass plate, also hot and greased, so as to touch every point of the gelatine while resting on the edges of the frame. By its pressure the thin cake is rendered uniform. When the glass plates have cooled, the gelatine will be solid and may be removed. It can then be cut into disks by punches, etc. It can of course be colored by adding suitable coloring material, aniline colors for instance.

Gems, Imitation. See **Jewels.**

Geranium Water. See **Waters.**

Gerbe. See **Pyrotechny.**

German Silver. See **Alloys.**

German Silver, to Polish. See **Polishing.**

German Silver, Solder for. See **Soldering.**

Gersnein's Alloy. See **Alloys.**

Gesso.—A formula for a drying powder for oil and distemper painting, and to make the colors retain their brilliance, is this:

Pure silica	4 drm.
Calcined borax	12 drm.
Litharge	24 drm.

Mix and fuse into a crystal, which must be powdered and levigated with water.

Gilding.—*Gilding by Immersion in a Solution of Chloride of Gold.* Articles of steel, copper, silver, and some other of the baser metals, may be gilded by simply immersing them in a

weak solution of the chloride of gold; this is, however, more interesting as a fact than of any practical value.

Solution for Gilding Brass and Copper.—The following formula has been adopted for water gilding, as it is termed. Fine gold, 6¼ dwts. Convert the gold into chloride and dissolve in 1 qt. of distilled water, then add 1 lb. bicarbonate of potassium and boil the mixture for two hours. Immerse the articles to be gilded in the warm solution for a few seconds, up to one minute, according to the activity of the bath.

2. Another method of gilding brass and copper articles, by simple immersion, is to first dip them in a solution of proto-nitrate of mercury (made by dissolving quicksilver in nitric acid and diluting with water) and then dipping them into the gilding liquid. It is said that copper may be gilded so perfectly by this method as to resist for some time the corrosive action of strong acids. During the action which takes place, the film of mercury, which is electro-positive to the gold, dissolves in the auriferous solution, and a film of gold is deposited in its place.

Process of Gilding.—Place in a plate leaf gold, add a little honey; stir the two substances carefully together with a glass stopper, the lower end of which is very flat. Throw the resulting paste into a glass of water mixed with a little alcohol; wash it and leave it to settle. Decant the liquid and wash the deposit again. Repeat the same operation until the result is a fine, pure, and brilliant powder of gold. This powder, mixed with common salt and powdered cream of tartar, and stirred up in water, serves for gilding.

As another method of gilding, Boutet Mouvel gives the following: Dissolve in aqua regia 1 grn. of fine gold, previously rolled out very thin, in a porcelain capsule heated on the sand bath and concentrated till it is the color of ox blood. Add 1 pt. of distilled water, hot, in which have been dissolved 4 grn. of white cyanide of potassium. Stir with a glass rod, and filter the liquid through unsized paper. To gild with this liquid, it is heated a little above lukewarmness, and the articles to be gilt are immersed in it and supported upon a piece of very clean zinc.

Gilding Solution, Becquerel's.—Chloride of gold, 1 part; ferrocyanide of potassium, 10 parts; water, 100 parts. Dissolve the salts in the water, then filter. Add 100 parts of a saturated solution of ferrocyanide of potassium, and dilute the mixture with once or twice its volume of water. In general the tone of the gilding varies, according as the solution is more or less diluted. The color is most beautiful when the liquid is most dilute and most free from iron (from the ferrocyanide). To make the surface appear bright, it is sufficient to wash the article in water acidulated with sulphuric acid, rubbing gently with a piece of cloth.

Solution for Gilding Bronze, etc.—Small articles may be gilded by immersing them in the following solution, which must be used at nearly boiling heat. Caustic potash, 180 parts; carbonate of potash, 20 parts; cyanide of potassium, 9 parts; water, 1,000 parts. Rather more than 1½ parts chloride of gold is to be dissolved in the water, when the other substances are to be added and the whole boiled together. The solution must be strengthened from time to time by the addition of chloride of gold, and also after being worked four or five times, by the addition of the other salts in the proportions given. This bath is recommended chiefly for gilding economically small articles of cheap jewelry, and for giving a preliminary coating of gold to large articles, which are to receive a stronger coating.

Brass and Copper, Solution for Gilding.—Fine gold, 6¼ dwts. Convert the gold into chloride and dissolve it in 1 qt. water and add potassium bicarbonate, 1 lb., and boil for two hours. Immerse the articles for one minute.

Coloring Processes.—When gilding is of an inferior color, it is sometimes necessary to use some process to improve the color. There must always be a sufficient coating of gold upon the article to withstand the action of the materials employed. This condition being fulfilled, the artificial coloring processes may be applied with advantage, and gold surfaces of great beauty obtained.—Sulphate of copper, 2 dwt.; French verdigris, 4 dwt. 12 grn.; sal ammoniac, 4 dwt.; niter, 4 dwt.; acetic acid, about 1 oz. The sulphate of copper, sal ammoniac and niter are first pulverized in a mortar, then the verdigris is added and well mixed with the other ingredients. The acetic acid is then poured in, a little at a time, and the whole worked up together, when a thin mass of a bluish green color will result. The article to be colored is to be dipped in the mixture, and then placed on a clean piece of sheet copper, which is next to be heated over a clear fire, until the compound assumes a dull black color; it is now allowed to cool, and is then plunged into a tolerably strong sulphuric acid pickle, which soon dissolves the coloring salts, leaving the article a fine gold color. Rinse well in hot water to which a small quantity of carbonate of potash should be added; next brush with warm soap and water, then rinse in hot water.

Coloring Gilt Work.—In working gold solutions employed in the dipping process, it may sometimes occur that the color of the deposit is faulty and patchy instead of being of the desired rich gold color. To overcome this, certain coloring salts are employed, the composition of which is as follows: Nitrate of potash, sulphate of zinc, sulphate of iron, alum, of each equal parts. These substances are placed in an earthenware vessel, and melted at about the temperature of boiling water. When fused the mixture is ready for use. The articles are to be brushed over with the composition and then placed in a charcoal furnace, and heated until, by applying the moistened tip of the finger to one of the pieces, a slight hissing sound is heard. This indicates that the heat has been sufficient. Then the articles should be at once removed and thrown quickly into a very weak sulphuric acid pickle, which dissolves the salts and leaves the work clear and bright. This coloring process has a rather severe action upon gilt work, and should not be used when the gilding is a mere film.

Books, the Edges of, to Gild.—To gild the edges, the book should be put into the press straight and on a level with the cheeks of the press between cutting boards, the boards of the book being thrown back. The press should be screwed up very tightly, and any projection of the cutting boards should be taken away with a chisel. If the paper is unsized or at all spongy, the edge should be sized and left to dry. This may be ascertained by wetting a leaf with the tongue; if spongy, the moisture will sink through as in blotting paper. The edge should be scraped quite flat and perfectly even, care being taken to scrape every part equally, or one part of the edge will be hollow or perhaps one side scraped down, and this will make one square larger than the other. When scraped quite smooth and evenly, a mixture of black lead and thin glair water is painted over the edge, and with a hard brush it is well brushed until dry.

The gold is now cut on the gold cushion. Lift a leaf out of the book with the gold knife, lay it on the gold cushion, breathe gently on the center of the leaf to lay it flat; it can then be cut with ease to any size. The edge is now glaired evenly, and the gold is taken up with a piece of paper previously greased by drawing it over the head. The gold is then gently laid on the edge which has been glaired. The whole edge or end being done, it is allowed to get perfectly dry, which will occupy two hours.

Before using the burnisher on the gold itself, some gilders lay a piece of fine paper on the gold, and gently flatten it with the burnisher. Books are often treated in this manner: they then become dull gilt. When intended to be bright, a waxed cloth should be gently rubbed over the surface two or three times before using the burnisher. The beauty of burnishing depends upon the edge presenting a solid and uniform metallic surface, without any marks of the burnisher.

Gilding Books.—White of egg well beaten up is the ordinary sticking material used by binders to put the gold leaf on. The leather back of the book is varnished with it, and when dry, a strip of gold leaf is put on the place where the letters or ornaments are to be placed; the letters used are common printing types (they must be new, however, and not been used with printing ink). They are heated a little above the boiling point of water, which is easily tried with a wet finger, and then they are pressed on the gold leaf for a few seconds only, when the heating of the albumen or white of egg under it fixes them to the leather of the book. The ornamental figures used are commonly made of brass and manufactured for the use of book binders, while the type is screwed in an appropriate brass or iron holder, with wooden handle. The back of a well-bound book being always round, the proper way of putting on the gilded letters and ornaments requires a certain way of manipulation, which it is best to acquire by visiting some good book binder's shop in the next large city to see the operation and use your eyes properly so as to get all little details. The sides of books being flat, it is best to put the letters and ornaments under a press. The type is put up in a proper form, it is heated, put under the press with the varnished side of the book, covered with gold leaf on the right place, and the press screwed down. Sometimes the binder puts the strip of gold leaf on the face of the type, in place of on the book. This is equally good, and under certain circumstances preferable.

Watch Plates, to Gild.—After plating with gold, using the regular solution (cyanide), immerse in a mixture of:

Copper sulphate.....	3 parts by weight.
Verdigris.....	7 parts by weight.
Ammonium chloride.	6 parts by weight.
Potash nitrate.....	6 parts by weight.
Acetic acid	31 parts by weight.

Use solids in powder. After dipping, heat the articles on a plate of copper until they turn dark or black, and then treat with concentrated sulphuric acid.

2. Or instead of above mixture use:

Alum	3 parts by weight.
Potash nitrate....	6 parts by weight.
Zinc sulphate.....	3 parts by weight.
Sodium chloride....	3 parts by weight.

Use as a paste; coat articles with it, heat on iron plate until they turn black, and wash with cold water.

Calf and Sheepskin, Gilding on.—Wet the leather with the white of eggs; when dry, rub it with your hand and a little olive oil, then put the gold leaf on and apply the hot iron to it. Whatever the hot iron shall not have touched will go off by brushing.

Cards, to Gild the Edges of.—1. Obtain an extremely thin leaf of gold. Put your cards together so that the edges are perfectly even. Then place in a press, with the exposed edge uppermost. Coat the edge with a mixture of red chalk and water. The gold is blown out from small books, and spread on a leather cushion, where it is cut to the proper size by a smooth-edged knife. A camel's hair pencil is dipped into white of egg mixed with water, and with this the partially dry edge is moistened; the gold is then taken up on a tip brush and applied to the moistened edge, to which it instantly adheres. When all the four edges have been gilt in this way, and allowed to remain a very few minutes, take a burnisher formed of a very smooth piece of hard stone (usually bloodstone), and rub the gold very forcibly, which gives the gold a high degree of polish. To silver edges take a brush, dip it in a saturated solution of gallic acid, and wash the edges; then dip the brush into a solution composed of 20 parts nitrate of silver to 1,000 parts distilled water. Keep on alternating these solutions until the edges assume a brilliant tint. Then wash with distilled water, and dry by free air and heat.

2. A composition consisting of 4 parts of Armenian bole and 1 of candied sugar, ground together with water to a proper consistence and laid on by a brush with the white of an egg. This coating, when nearly dry, is smoothed by the burnisher. It is then slightly moistened by a sponge dipped in clean water and squeezed in the hand, after which gold leaf is applied.

China, Common, Gilding on.—The gilding is done either by an adhesive varnish or by heat. The varnish is prepared by dissolving in hot boiled linseed oil an equal weight of either amber or copal. This is diluted with a proper quantity of oil of turpentine so as to be applied as thin as possible to the parts to be gilt. Let stand after varnishing about twenty-four hours, then heat in an oven until so warm as almost to burn the fingers when handled. The heat softens the varnish, which is then ready to receive the gold leaf, which may be applied with a brush or pledget of cotton, and the superfluous portions brushed off. Burnish when cold, interposing a piece of thin paper between the gold and burnisher. Where burning in is practiced the gold reduced to powder is mixed with powdered borax glass (anhydrous borax), moistened with a little gum water, and applied to the clean surface with a camel hair pencil. When quite dry the article is put into a stove heated to about the temperature of an annealing oven. The gum burns off and the borax, by vitrifying, cements the gold with great firmness to the surface.

Gold Luster for China Painting.—Dissolve 1 drm. gold in ¾ oz. aqua regia, or simply dissolve this weight of chloride of gold in water. Add 6 grn. of metallic tin, and enough aqua regia if required to dissolve it. Pour with constant stirring into a mixture of ½ drm. balsam of sulphur and 20 grn. oil of turpentine. As it stiffens add ½ drm. oil of turpentine and mix. More gold gives a brighter effect; tin inclines it to a violet tinge. Balsam of sulphur is made by boiling together in a covered vessel 1 part flowers of sulphur and 4 parts oil until the mass thickens.

Cotton, to Gild.—The cotton should be spread with glue, dried, then coated with a thick solution of parchment size and dried again thoroughly. Then apply the gilding.

To Dissolve Gold for Gilding which has to be Fired.—Triturate in a mortar some gold leaf and honey until reduced very fine. Then dissolve the honey with hot water and mix with a little gum water for use, or dissolve gold in hot aqua regia, evaporate to dryness in a porcelain dish and dissolve in ether for use.

Gilding Glass.—1. Thoroughly clean the glass, then take some very weak isinglass size, and while warm float the glass where you intend the gold to be laid, with the size and a soft brush; then lay the gold on with a gilder's tip, previously drawing it over the hair of your head to cause the gold to adhere to it. Tilt the glass aside to allow the superfluous size to run away, then let it dry, and if it does not look sufficiently solid upon the face, give another layer of gold the same way. Where the black lines are to show, take a piece of pointed firewood, cut to the width the lines are needed, and with a straight-edge draw a line with the piece of wood, which, if made true and smooth, will take the gold off clean, and so square and sharpen up all the edges, lines, etc. When this

is done, give a coat of Brunswick black thinned with a little turps, and the lines will show black, and it will preserve the gold. Try a small piece first, so as to get all in order.

2. The proper flux is anhydrous borax; the real gilding is effected by the aid of heat. For this purpose a solution of gold in aqua regia (chloride of gold) is precipitated by potash or green vitriol—a finely divided powder (brown) consisting of metallic gold. This is washed, dried and rubbed up with the flux (anhydrous borax). Mix the same with oil of turpentine or gum water; apply with a brush. When heated in the muffle, the volatile oil escapes; the gum consumed, the borax melts and firmly attaches the gold to the surface of the vessel.

3. Two grn. of isinglass; new rum, 2 parts; water, 3 parts. Put the water and the isinglass into a clean pan, and let them simmer over the fire for about an hour; add the rum when taken off the fire, then let it cool. Clean the glass, pour on the liquid, gild with camel's hair tip, set the glass upon its edge; the liquid will run from beneath the gold, and in less than twenty minutes you will have a burnished plate. When dry, rub lightly with fine cotton; if there are any spots not gilded, gild them. Draw your design on paper, perforate your lines with a needle, put your paper next the gilded side, with the reading the wrong way, dust through the holes with a rag and whiting, lift off the paper and you will find your design marked off. If you wish the letters left clear black, cut round the letters with yellow, paint all over but the letters, wash off the gold with water, then paint all over black. If you want the letters gold, paint the letters yellow, and wash off the surplus gold, then paint all over black.

4. Prof. Schwarzenbach, of Berne, has recently devised the following method of gilding on glass: Pure chloride of gold is dissolved in water. The solution is filtered and diluted until in 20 qt. water but 15 grn. gold are contained. It is then rendered alkaline by the addition of soda. In order to reduce the gold chloride, alcohol, saturated with marsh gas and diluted with its own volume of water, is used. The reaction which ensues results in the deposition of metallic gold and the neutralization of the hydrochloric acid by the soda. In practice, to gild a plate of glass, the object is first cleaned and placed above a second plate slightly larger, a space of about $\frac{1}{10}$ in. separating the two. Into this space the alkaline solution is poured, the reducing agent being added immediately before use. After two or three hours' repose, the gilding is solidly fixed, when the plate may be removed and washed.

Embossing and Gilding on Glass.—There are two ways of embossing glass: by means of hydrofluoric acid and by the sandblast. The second method being rather beyond the power of amateurs, I shall not describe it here. In the hydrofluoric acid process, the glass is first coated with some protecting substance, and upon this the design is drawn with a sharp instrument, so as to expose the glass below. The acid is then applied, when the exposed portion of the glass becomes corroded. The wax can be afterward removed. In practice the glass should be warmed and coated with molten beeswax (not paraffin, which is too brittle). Superfluous wax should drained off, so as to leave as thin a coating as possible. Or a composition may be used, formed by melting together 2 parts of beeswax, 2 of asphalt, 1 of black pitch and 1 of Burgundy pitch, and heating them together until a drop placed upon a cool surface gets hard and tough. Whatever the protecting substance used, it should be permitted to set, and the design should then be traced with some pointed instrument, care being taken to cut right down to the glass. If the design is complicated, it will be found better to trace it first on paper, and then to go over the lines with a pricker. The paper can then be placed upon the wax and some dark colored powder dusted over the holes. On removing the paper, the outline of the design will be found marked on the surface of the wax. It will then be easy to cut away the wax at the desired places. A shallow tray of guttapercha or of sheet lead must then be taken, and into it be placed about half an inch of the dilute hydrofluoric acid of commerce. The glass must then be placed wax side down over the tray and left exposed to the vapor of the acid for some time. On removing it, washing with water, and cleaning off the wax, the design will be found etched in opaque lines upon a bright ground. If required bright upon an opaque ground, the waxed glass, instead of being exposed to the vapor of the acid, should be dipped into the acid itself. After the removal of the wax the surface of the glass should be ground with very fine emery. Another way is to draw the design on the glass with a pencil and Brunswick black, using as a guide a sketch on paper placed beneath the glass. On exposure to the acid vapor the whole background will be rendered opaque. The Brunswick black can be cleaned off with turpentine, leaving the design in clear glass. Instead of Brunswick black, an ink may be used, made by dissolving asphalt in turpentine, and thickening with beeswax and resin. Where it is desired to produce an artistic effect by the introduction of shading, recourse may be had to Gruene's patent process, wherein the wax or Brunswick black is replaced by substances not altogether impervious to the action of the acid. The design is drawn with oil varnishes, greasy printing inks, or some such substances (using a good protector for the high lights, a bad protector for the deep shades, and so on), and is then dusted over with finely powdered metal, copal, etc. When dry, the glass is dipped into hydrofluoric acid and allowed to remain in for a few seconds and is afterward washed. If care is taken in the selection of the protecting materials, it is possible for an artistic workman to obtain very striking results.

Gilding may be done either with bronze powder or with gold leaf. If the powder is to be used, the design should be traced on the wrong side of the glass with japan gold size thinly laid on, which is afterward dusted over with bronze powder. When dry, a coat of varnish is laid on. In tracing the design, it must not be forgotten that the wrong side of the glass is being worked at, and that when viewed from the front everything will appear twisted round—the right being to the left and the left to the right. To gild with leaf, the glass must be carefully cleaned and laid upon the design. Then a solution of isinglass is put on by aid of a flat camel hair brush. While still wet, gold leaf is laid on with a gilder's tip (for the sake of economy adhering to the design as nearly as possible). When quite dry, the design, the outline of which has been pricked out as before described, is taken and placed upon the gold. Dark colored powder is then sprinkled on as before. The paper is next removed and the outline carefully gone over with Brunswick black. The superfluous gold is cleaned off by the aid of a sharp narrow chisel. The size is made by dissolving ¼ oz. of isinglass in a sufficiency of water, adding ¼ pt. rectified spirits, and making up to half a pint with water.

Note.—If hydrofluoric acid is dropped upon the fingers it is desirable to wash it off without unnecessary delay; but let no one be deterred from using the acid by the dreadful things the textbooks say of it. They don't apply to the diluted acid sold at the shops.—*Alfred W. Soward.*

5. Dissolve a piece of isinglass (gelatine) the size of a silver dollar in ½ pt. of hot water, and after cooling apply this size, with a 2 or 3 in. flat camel's hair brush, to the glass, previously freed from all traces of grease by washing with alcohol; apply the gold leaf cut to the size of let-

ters desired with a gilder's brush, rubbing the brush on the hair while the size is wet. In presenting the gold leaf to the sized surface do not touch the glass with brush or gold; bring the leaf within ½ in. of the surface, when it will be found that the leaf leaves the brush and attaches itself to the sized surface (owing to the electrical condition of the brush). Spread the leaf evenly, give it a second coating of the size, outline with asphaltum varnish and fill up the letters with the same. When all is dry rub off the superfluous gold with cotton wool.

Granite, Gilding on.—Apply a coat of size and then two or three coats of size and fine powdered whiting. Let each coat dry and rub down with fine glass paper before the next is applied. Then go over it thinly and evenly with gold size and apply the gold leaf.

Iron, to Gild.—Kirchmann says: Rub the surface of the iron with sodium amalgam, then apply a strong solution of chloride of gold; on heating, mercury will be driven off and the iron will be gilded.

Ivory, to Gild.—Put the ivory into a solution of sulphate of iron (copperas), and then into a solution of nitro-muriate of gold; on withdrawing it from the latter it will be beautifully gilded.

Gilding Metals with Gold Leaf.—Articles of steel are heated until they acquire a bluish color, and iron or copper is heated to the same degree. The first coating of gold leaf is now applied, which must be gently pressed down with a burnisher and again exposed to gentle heat; the second leaf is then applied in the same way, followed by a third, and so on; or two leaves may be applied instead of one, but the last leaf should be burnished down while the article is cold.

Gilding, Wax for. See **Waxing.**

Gold Beaters' Skin.—Is prepared from the peritoneal membrane of the cæcum of the ox. It is used to separate the leaves of gold while under the hammer, as a nearly invisible dressing for cuts, as tissue for court plaster, etc.

Gold, Powdered.—Divided gold, gilding powder, gold bronze, gold color, Auri pulvis. Gold 1 part, mercury 7 parts; form an amalgam and expose it to heat until all the mercury is volatilized; or the mercury may be dissolved out with hot nitric acid. In either case the residuum is to be powdered, washed and dried. If the quantity operated on is considerable, the process should be so conducted as to save the mercury.

Coloring of Gold.—This operation consists of imparting a color to gold articles after every other process has been completed. Its object is to give to alloyed gold all the appearance of fine gold itself, by dissolving out the base metal from the surface of the articles and leaving a facing of gold of a deep rich color. Two distinct modes of coloring are adopted by jewelers, termed respectively dry coloring and wet coloring. The latter is most frequently practiced, as the former cannot well be applied to gold inferior to 18 carat.

Wet Coloring.—The ingredients of the mixture employed in this process have a powerfully solvent action on the base metal with which the gold is alloyed, and a weaker action on the gold itself, so that the article loses weight in direct ratio to the length of time it is submitted to the coloring process, and this loss is greater as the gold is lower in quality. Gee states that the coloring is hastened and the loss in weight reduced to a minimum by using old coloring liquid, and he assumes that the dissolved gold is, to some extent, deposited again on the article, because the loss in weight of some common qualities of gold was found to be very little, and the amount of gold recovered from the spent coloring liquid very small indeed. This statement is in accord with the well known fact that in any liquid in which a metal, say copper, is electro-positive to the metal in solution, say gold, the latter is deposited on the former.

Many different mixtures are used for coloring gold, some of which will be afterward given in tabular form. The following has been supplied by an experienced Birmingham jeweler, which he has found to be effective:

Potassium nitrate	12 oz.
Common salt	6 oz.
Hydrochloric acid	3 oz.

The nitrate and salt are pounded to a fine powder and placed in a previously warmed plumbago crucible about 8 in. by 7 in., then stirred with a wooden spoon for a minute or two. The acid is then added with about 1 oz. of boiling water, and the mass constantly stirred until it boils up to the top of the pot. The work, which has been previously cleansed in hot potash or soda solution, is then suspended in the coloring liquid by means of a silver or platinum wire for about one minute, then well swilled in boiling water. A little more water is added to the color pot, and when the liquid boils up the work is again immersed for another minute, and swilled in boiling water as before. This operation of dipping and swilling is repeated several times, the coloring liquid being weakened by adding water before each immersion, until the desired appearance is attained. The work is finally well washed in hot water and dried in boxwood sawdust. The whole process takes five to seven minutes.

The colored work is next scratch-brushed, on a lathe, with a revolving brush made of very fine brass wire and having stale beer dropping on it. If the coloring has been properly conducted, a beautiful rich and dead color will be produced.

Dry Coloring.—This term is applied to the coloring process when no liquids are used as constituents of the mixture. The ingredients used are—

Potassium nitrate	8 oz.
Common salt	4 oz.
Alum	3 oz.

These substances are ground to a fine powder, well mixed and placed in a previously heated blacklead color pot, of the same dimensions as that described for use in wet coloring, but the same pot must not be employed for dry coloring as has been used for the wet process. It is well to get the pot nearly red hot before placing the color in it. The mixture must then be constantly stirred with an iron rod. It will first boil up as a greenish liquid, then solidify, and afterward boil up a second time and become thoroughly fused, having a brownish yellow color. At this stage the work, which has been previously annealed and dipped in dilute aquafortis, is dipped in the color, being suspended on a silver or platinum wire, the latter being preferred, and kept in motion for about a minute and a half, then immersed in boiling water containing a little aquafortis. The immersion and swilling are again repeated, when the articles possess a beautiful color. They are then washed in hot water containing a little potash, and finally dried in warm boxwood sawdust.

In dry coloring the work should be as highly polished as possible previous to the coloring, for the brighter it is the better will be the final color. The time given above is only intended as a general guide, as some work will color much quicker than others, and the time can only be arrived at by experience. The following mixtures have been recommended for coloring:

Dry Process.

1.	Potassium nitrate	8 oz.
	Common salt	4 oz.
	Alum	4 oz.
2.	Sal ammoniac	4 oz.
	Potassium nitrate	4 oz.
	Borax	4 oz.

Wet Process.

Potassium nitrate	8	14	15	14
Common salt	4	7	7	7
Alum	4	7	7	..
Hydrochloric acid	..	2	1	5
Water in each case	..	..	..	..

The following is a useful mixture for removing tarnish from colored gold articles which have been kept in stock for some time:

Bicarbonate of soda	2 oz.
Chloride of lime	1 oz.
Common salt	1 oz.
Water	16 oz.

Well mix the above ingredients and apply with a soft brush.

Gold, Etruscan, Color on.—Alum and fine table salt each 1 oz.; powdered saltpeter, 2 oz.; hot rain water sufficient to make solution. Add sufficient muriatic acid to produce the color desired. The solution is best used warm. After coloring wash in soft water, then in alcohol, and dry in clean sawdust.

Gold Leaf.—About 160,000 leaves are required to make an inch in height.

Gold, to Plate With. See **Electro-Metallurgy.**

Melting Points of Gold.—The following shows the degree of heat at which gold of varying degrees of fineness melts: 23 carat gold, 2,012° F.; 22 carat, 2,009°; 20 carat, 2,002°; 18 carat, 1,995°; 15 carat, 1,992°; 13 carat, 1,990°; 12 carat, 1,987°; 10 carat, 1,982°; 9 carat, 1,979°; 8 carat, 1,973°; 7 carat, 1,960°; composition, 1,587°.

Fine gold will melt at 2,016° F.; pure copper at 1,994°; fine silver at 1,873°, and pure spelter at 773°.

Gold Leaf, to Burnish.—The burnishers used by the frame gilder are either of flint or agate, generally the former. They are made of various sizes and shapes to suit the work. These are passed lightly over the gilded and dry work. Frame gilding requires much practical dry work until properly burnished. It is then usually given a thin coat of very weak clear experience to do properly.

A kind of varnish is put on silver leaf to make it appear like gold. Dissolve, by digestion, fine pale shellac in alcohol, and color with turmeric and dragon's blood.

Leather, Gilding or Silvering.—1. To ornament the sides of an album, finely powder some resin and dust it over the surface of the leather; then lay on the leaf and apply (hot) the letters or impression you wish to transfer; lastly, dust off the loose metal with a cloth.

2. The cover is first washed with clear gum water. The parts to be gilded are then coated twice with white of egg beaten into a froth and allowed to subside into a clear liquid. A little ammonia may be added. To gild spread a leaf of gold on the gilding cushion with a knife, and blow it flat, then cut it into strips about one-fifth inch wide. Heat the tool until it is just hot enough to fizz under the wet finger; if it sputters it is too hot and will burn the leather; touch its edge with a rag slightly moistened with sweet oil, and with the same rag rub over the part of the book to be gilt. Roll the tool softly on the strips of gold, which will adhere to it, and when enough is taken up roll it with a heavier pressure along the places to be gilt, and the gold will be transferred to the leather, the excess being wiped away with a soft rag.

Gilding, Liquor.—Alum and common salt, of each 1 oz.; purified niter, 2 oz.; water ¼ pt.; used to impart a rich color to gold surfaces, principally trinkets. Its application should not be too long continued, as it dissolves a small portion of the gold. For common purposes it is best used diluted with water.

Marble, to Gild Letters on.—Apply a coating of size first, then apply successively several coats of size thickened with whiting until a good face is produced. Let each coat dry, and rub it down with fine glass paper before applying the next. Then go over the marble thinly and evenly with gold size. Apply the gold leaf, and burnish with an agate. The gold leaf must be applied several times to give a good effect.

Mercury Gilding.—Preparation of the Amalgam.—To prepare the amalgam of gold for the purpose of mercury gilding, weighed a quantity of fine or standard gold is first put in a crucible and heated to dull redness. The requisite proportion of mercury, 8 parts to 1 part of gold, is now added, and the mixture is stirred with a slightly crooked iron rod, the heat being kept up until the gold is entirely dissolved by the mercury. Pour the amalgam into a small dish about 3 parts filled with water and work about with the fingers under the water to squeeze out as much of the excess of mercury as possible. To facilitate this, the dish is slightly inclined to allow the superfluous mercury to flow from the mass, which soon acquires a pasty condition capable of receiving the impression of the fingers. Afterward squeeze the amalgam in a chamois leather bag, by which a further quantity of mercury is liberated; the amalgam which remains after this final treatment consists of about 33 parts of mercury and 57 parts of gold in 100 parts. The mercury which is pressed through the bag retains a good deal of gold, and is employed in preparing fresh batches of amalgam. It is important that the mercury employed should be pure.

The Mercurial Solution.—To apply the amalgam a solution of nitrate of mercury is employed, which is prepared by dissolving in a glass flask 100 parts of mercury in 110 parts of nitric acid, of sp. gr, 1·33, gentle heat being employed to assist the chemical action. The red fumes which are given off must be allowed to escape into the chimney, since they are highly deleterious when inhaled. When the mercury is all dissolved the solution is to be diluted with about 25 times its weight of distilled water and bottled for use.

Applying the Amalgam.—The pasty amalgam is spread with the blade of a knife upon a hard, flat stone; the article, after being well cleaned and scratch-brushed, is treated in the following way: Take a small scratch brush, formed of stout brass wire, dip in the solution of nitrate of mercury, then draw over the amalgam; pass the brush carefully over the surface to be gilded, repeatedly dipping the brush in the mercurial solution, and drawing it over the amalgam, until the entire surface is uniformly and sufficiently coated. Then rinse the article well and dry. The next operation is the evaporation of the mercury. For this purpose a charcoal fire, resting upon a cast iron plate, has been generally adopted, a simple hood of sheet iron being the only means of protection from the injurious effects of the mercurial vapors. When the amalgamated article is rinsed and dried, it is exposed to the glowing charcoal, turned about and heated by degrees to the proper point; then it is withdrawn from the fire by means of long pincers or tongs. The article is then taken in the left hand, which should be protected with a leather glove, turned over the fire in every direction, and while the mercury is volatilizing the article should be struck with a long-haired brush to equalize the amalgam coating and force it upon such parts as may appear to require it. When the mercury has become entirely volatilized the gilding has a dull, greenish yellow color. If any bare places are apparent they are touched up with amalgam and the article again submitted to the fire, care being taken to expel the mercury gradually. The article is then well scratch brushed; when it is of a pale, greenish color, heat it again to expel any remaining mercury, when it acquires the orange yellow of fine gold.

If required to be bright it is burnished in the ordinary way.

Gilding Metal.—The metal employed for gilding is usually brass or a mixture of brass and copper. The following alloys have been recommended:

1. Copper, 6 parts; brass, 1 part.
2. Copper, 4 parts; Bristol brass, 1 part.
3. Copper, 13 parts; old Bristol brass, 3 parts; tin, 14 parts.

Mixtures employed in gilding by fire or by the wet processes.

Red Ormolu.—Potash alum, nitrate of potash, 30 parts of each; sulphate of zinc, 8 parts; common salt, 3 parts; red ocher, 28 parts; sulphate of iron, 1 part. Add to it a small proportion of annatto, madder, cochineal or other coloring matter, ground in water or in weak vinegar.

Yellow Ormolu.—Red ocher, 17 parts; potash alum, 50 parts; sulphate of zinc, 10 parts; common salt, 3 parts; nitrate of potash, 20 parts.

Dead Luster for Jewelry.—Sulphate of iron, sulphate of zinc, potash alum, nitrate of potash, equal parts of each. All the salts are melted in their water of crystallization.

Hard Dead Luster for Clocks.—Water, 5 parts; nitrate of potash, 37 parts; potash alum, 42 parts; common salt, 12 parts; pulverized glass and sulphate of lime, 4 parts. The whole is thoroughly ground and mixed.

Soft Dead Luster for Smooth Surfaces and Figures.—Water, 5 parts; nitrate of potash, 46 parts; potash alum, 46 parts; common salt, 3 parts. The same treatment as the preceding mixture.

Green for Red Luster.—Bitartrate of potash, 65 parts; common salt, 25 parts; acetate of copper, 10 parts. The whole is ground together.

Wax for Gilding.—Oil, 25 parts; yellow wax, 25 parts; acetate of copper, 13 parts; red ocher, 37 parts. The whole is melted and stirred until cold.

Gold Leaves, to Apply to Paper.—Glaire, which is pure albumen, is sometimes used. It is made by shaking up the white of an egg with a few drops of ammonia and drawing off the clear liquid, which has subsided on standing. This is painted on the lines, and by slight heat, as of a hot iron, the leaf adheres. Gold size is used on thick paper, or thick gum arabic water may be used. The illuminators of to-day cannot get as good results as did the old workers of the middle ages. The old gilding is never equaled now.

Gilding, Oil.—This species of gilding may be divided into several operations.

1. The surface is prepared by a coating of white lead in drying oil.

2. Another coat is given, made with calcined white lead or masiscot ground in linseed oil and turpentine; three or four coats of this mixture are often given, observing to carefully smooth off each coat with pumice or shave grass before the application of the following ones.

3. The gold color, or paint, is next applied. It is usually very adhesive gold size, or the bottom of the pot or dish in which painters wash their brushes. For this purpose it is thoroughly ground and strained.

4. When the gold color becomes partially dry and sufficiently tenacious, the gold leaf is applied and pressed on with a wad of cotton, wood or a soft brush.

Preparation and Gilding of Picture Frames.—For the following description of picture frame gilding we acknowledge our indebtedness to "Workshop Receipts," Series 1: Suppose that we have a plain picture frame; it is made by the joiner into a 12 feet length of moulding, and in that state it passes into the hands of the gilder. He first gives it a priming of hot size and whiting, called thin white. The whiting employed by the gilder is not the same as that used for domestic purposes, but is finer and more free from grit. The size employed is prepared by the gilder from parchment cuttings or glove cuttings. The cuttings are well washed in water and then boiled in a certain quantity of clean water until the latter has a particular degree of adhesiveness, which can only be determined by experience; this is then poured off into a clean, dry vessel and allowed to cool. When about to be used, the grease at the top and the sediment at the bottom are cut off with a knife, the size is melted in an earthen pipkin, and a small quantity of finely powdered whiting is mixed with it. When the thin white is dry all holes and irregularities in the moulding are filled up with putty. This putty is not the same as that employed by the glazier, but consists of whiting and size mixed to the consistence of putty. When the puttying is dry, a coating of thick white is laid on with a brush. This thick white differs from the thin white only in having a larger proportion of dry whiting mixed with a given amount of size, the consistence attained being rather thicker than that of oil paint. When the first thick white is dry another is laid on in the same manner, and, similarly, a third, a fourth and a fifth are laid on, all about equal in thickness, and each one being perfectly dry before the next is applied. As in laying on this large body of thick white, the fine squares, hollows and fillets would be liable to be stopped up and lose all their clearness and sharpness, opening tools, consisting of crooks, chisels and gouges, are drawn along the fine parts of the moulding, while the thick white is still wet, by which means the forms of the various mouldings are retained. This is still better effected by the double opening white, which consists of two thick whites, the one laid on almost immediately after the other, by which a thick soft coating covers the moulding. Hard stones, shaped to the forms of the mouldings, together with the opening tools before described, are to be worked over every part of the moulding, by which asperities are smoothed down, depressions filled up and edges brought up nearly to their required sharpness. In this state the whiting on the moulding is from one-sixteenth to one-twelfth of an inch in thickness. It is now trimmed at the back and edges by cutting off the whiting which had flowed over from the front, which prepares it for the process of smoothing. This is done by means of pieces of pumice and other stones, shaped so as to fit the various parts of the moulding. A sponge or soft brush is used to wet the moulding, and the stone which is to be used, being likewise wetted, is rubbed or worked to and fro along the moulding until that part is perfectly smooth. Another stone, fitting a different part, is then used in the same way, and so on, until every part of the length and breadth of the moulding has been worked over by the stones. The moulding, if the smoothing has been properly performed, now presents a smoothness of surface exceeding and a keenness of the edge nearly equaling that which the moulding presented when it left the hands of the joiner; but this must be attained without rubbing off too much of the whiting, since the whole beauty of the frame mainly depends on having a sufficient body or foundation of whiting. The brilliant burnishing on frames is, in a peculiar degree, dependent on the whiting which is first laid on the wood, and which, if deficient in quantity, cannot be adequately replaced by other means. The moulding being thoroughly dried from the effects of the smoothing, is rubbed down with glass paper or sand paper, to take off any little asperities that may remain, and to make the whole perfectly smooth. It is now ready for the process of gold sizing. The burnish gold size used in this process is composed of ingredients exceedingly opposite in their nature, such as pipe clay, red chalk, black lead, suet, and bullock's blood. This diversity of ingredients is intended to produce different effects; one substance helps to give a brilliancy to the burnish, another to the mellowness and smoothness, and so on. The form

in which the gilder purchases his burnish gold size is that of a solid rather softer than butter. He first takes some very clear size, boiled purposely to a smaller degree of strength than the size for thick white, or, if already boiled, weakened by water. This size he melts in an earthen pipkin, but without making it very hot, and then mixes the gold size with the melted size by means of a clean brush, much in the same manner as a painter mixes his oil paint; the consistence to be about equal to that of cream. It is a source of some confusion that the same term, burnish gold size, is applied to this creamy liquid as to the thicker substance from which it is prepared; it is necessary to say mixed gold size, or unmixed gold size, in order to indicate which is meant. This gold size is laid on the moulding either with a very soft hog hair brush, or by a large camel hair pencil fixed in a swan's quill. The gold size must be barely warm, and must be laid on with great care so as to leave it equally thick in every part, and obliterate the marks of the brush; upon the due observance of a medium between hot and cold, strong and weak, and thick and thin, in the gold size laid on, depends much of the beauty of the moulding when gilt. From 4 to 8 coats of this gold size are laid on the moulding, each one being perfectly dried before the next is applied. A soft, partially worn piece of glass paper is occasionally used, to take off any little roughness that may exist. When a sufficient body of gold size is laid on, it is carefully washed with clean water, a soft sponge and a piece of linen rag. This must be done with attention to the soft edges, which are very likely to lose the whole of their gold-size if care is not used; the object is to produce a perfectly smooth surface, especially in those parts which are to be matt gold.

The test of good work is to produce the smoothest surface with the least loss of gold size. When the moulding is partially dry from this process, the matt parts are polished with a piece of woolen cloth, and the parts to be burnished receive another coating of gold size, laid on as smoothly as possible. The piece of moulding which is to be gilt is laid along the bench with one end higher than the other; and as the width of the moulding is broken up into several divisions, such as hollows and squares, it would be impossible to make a leaf of gold bend into all the various parts without breaking. The gilder learns by experience how many separate lays, as they are called, of gold will be required to cover the width of the moulding without the breaking of the gold into irregular fractures called spider legs. In general, a deep hollow, or a depressed square, cannot be gilt at one lay, but must be covered with two strips of gold laid side by side and meeting at the center of the depression. When the gilder has made his decision as to the number of lays that will be required, he selects one lay, and proceeds with it through the whole length of the moulding before he begins another portion of the width. If the necessary lay be about ¾ or ⅞ of an inch in width, he cuts the leaf which is spread out on his cushion into four strips; if it be about 1 inch in width, he cuts the leaf into three, regulating the division of the leaf of gold according to the width of the lay. It is not often that a larger piece than half a leaf is used at once. The gilder has at hand a pan with clean water, and two or three camel hair pencils of different sizes. With one of these pencils he wets a few inches of that part of the moulding which is to form his first lay, taking care not to wet much beyond that lay. The water is to be allowed to remain pretty full on the surface, after some of it has been imbibed by the gold size. The gilder then takes his tip in his right hand, and lays it on the slip or gold, which slightly adheres to the hairs; whence he places it on the moulding, with particular attention to straightness of direction. It frequently happens that the hairs of the tip will not take up the gold; in such case it is usual to rub the hairs between the cheek and the palm of the hand, by which their power of taking up the gold is increased. When the gold is laid on it is blown forcibly, to expel as much of the water as possible from beneath it, the dry camel hair pencil being used to press down any parts which fail to adhere. Another portion is then wetted, and another piece laid on, lapping about ⅛ of an inch over the end of the former piece. Thus the gilder proceeds, piece after piece, until the one lay is carried down the whole length of the moulding; he then proceeds with another lay joining the former. In doing this he has to observe that the water must be made to flow a little over the edge of the former lay; but not so as to wash it up, or break away the edge; the second lay must lap a little over the first, and therefore the water must likewise extend over the first lay. Thus he proceeds with all the lays into which he has found it necessary to divide the width of the moulding; every piece, lengthwise, lapping over the piece previously put on, and every lay lapping over the previous lay. The moulding is then set aside to dry. There is a particular state or degree of dryness, known only by experience, in which the moulding is in a fit state for burnishing.

The burnishers used by the gilder are either of flint or agate, generally the former. The steel burnishers employed by the jeweler would not do for the gilder. Burnishers of different forms and sizes must be employed, in order to adapt them to the part of the work which is being burnished. They are generally crooked or curved near the end. When the burnishing is done, those parts which have not been burnished are weak sized, that is, they are wetted with water in which a very little clear piece of size has been melted; this helps to secure the gold. When dry, the gold is wiped carefully with a piece of soft cotton wool, to remove rough or ragged edges of gold; and there are now visible a number of little breaks, holes, and faulty places in the gilding, arising from the impossibility of laying on the gold quite soundly and perfectly.

These defective parts are repaired by the process of faulting, which consists of cutting up a leaf of gold into small pieces and laying them on the faulty places, previously wetted with a camel hair pencil. If the defective part is on the burnish, it is necessary to be careful not to wet any part but what is to be covered by the gold, as it will stain the burnished gold. When the faulting is dry, the gold is again carefully wiped, and finally wetted with finishing size. This is clear size of a certain degree of strength, laid on the matt parts with a pencil, and completes the process of gilding.

When a glass frame is to be gilt, the joiner's work is generally quite completed before the gilder begins, and great care is required in whiting such frames, to prevent filling up the corners with whiting, and giving them a clumsy appearance. For this purpose, modeling tools, such as chisels, gouges, and crooks, are used to clear out the corners from time to time, and preserve the original sharpness and clearness of the several parts.

Composition for Moulding.—The following is used by gilders: Mix 14 lb. of glue, 7 lb. resin, ½ lb. pitch, 2½ pt. linseed oil, 5 pt. of water, more or less according to the quantity required. Boil the whole together, well stirring until dissolved, add as much whiting as will render it of a hard consistency, then press it into mould, which has been previously oiled with sweet oil. No more should be mixed than can be used before it becomes sensibly hard, as it will require steaming before it can be used again.

Another Receipt.—Make a very clear glue with 3 parts of Flanders glue and 1 part of isinglass, by dissolving the two kinds separ-

ately in a large quantity of water, and mix them together, after they have been strained through a piece of fine linen to separate the parts which could not be dissolved. The quantity of water cannot be fixed, because all kinds of glue are not homogeneous, so that some require more than others. The proper strength may be found by suffering the glue to become perfectly cold; it must then barely form a jelly. The glue is to be gently heated, then mixed with sawdust sifted through a fine sieve. The moulds are then to be oiled with nut oil, and the glue pressed into the mould, covered with weighted board, and then set to dry near a stove. When the casting is dry it is to be trimmed.

Burnished Gilt Frames.—When new burnished gilding requires varnishing, white hard spirit varnish is used or yellow gold lacquer. Old burnished work must be cleaned with great care. First remove the dust with a badger hair brush; afterward clean the gilding by passing a clean sponge, dipped in gin and water, lightly over the surface, wiping off the moisture with a very soft dry sponge or silk handkerchief; then apply the varnish, and finish.

Cleaning Gilt Frames.—Gilt frames may be cleaned by simply washing them with a small sponge, wet with urine, hot spirits of wine, or oil of turpentine, not too wet, but sufficiently to take off the dirt and fly marks. They should not be afterward wiped, but left to dry of themselves.

Regilding Frames.—Take a sponge and some clean water and wash the frame well, then let it dry, procure some water gold size; make some thin size from dry hide or parchment, mix enough warm with the gold size to enable you to work it on the frame with a camel hair brush, give it two coats; when dry, rub it over with a piece of fine sand paper; it will then be ready for gilding. When the frame is covered, rest it on its edge to drain; when perfectly dry dip a pencil into water, and wipe the gold over with it; it will take the particles of gold off and make it appear solid. For any parts not covered, take bits of leaf with a dry pencil, and lay on as before, then give the whole a coat of clear parchment size, brush the back edges over with ocher, and the frame is then ready.

Signs, to Gild.—Use gold and silver leaf. Take a little fine isinglass, as much as will lie on a five cent piece, and dissolve in a little boiling water. Add as much alcohol as there is water, and strain through silk. Paint the letters on a sheet of paper with Brunswick black; fix the paper, with the writing reversed, on the glass. Use the isinglass solution as a mordant, laying it on with a camel's hair pencil, and then apply the gold leaf. Place the glass in a warm room; and when the gilding is dry rub over with a piece of cotton wool. Pass a flat camel's hair brush, moistened with the isinglass solution, lightly over the gold letters; let the solution be hot for this operation. A second coating of gold leaf will improve the work. Mark in the outline on the back with soap, use a size composed of gum tragacanth in water, have the size as thin as possible.

Solution for Gilding Silver.—Dissolve equal parts, by weight, of bichloride of mercury (corrosive sublimate) and chloride of ammonium (sal ammoniac) in nitric acid; now add some grain gold to the mixture, and evaporate the liquid to half its bulk; apply while hot to the surface of the silver article.

Size, Oil, for Gilding.—Grind calcined red ocher with the best and oldest drying oil, and mix with it a little oil of turpentine when used. When the work is to be gilded first give it a coat of parchment size; then apply the above size, where requisite, either in patterns or letters, and let it remain, till, by touching it with the finger, it feels just sticky; then apply the gold leaf and dab it on with a little piece of cotton; in about an hour wash off the superfluous gold with sponge and water, and when dry varnish with copal varnish.

Size for Bronzing and Gilding.—A combination of asphaltum, drying oil and spirits of turpentine will be found useful as a size for bronzing and pale gilding. A size for cloth, silk, etc., may be made by taking a little honey mixed with thick glue. This is to be reduced to a proper consistency, and it then has the effect of giving a fine bright luster.

Preserving Gilding.—The gilding on frames, etc., can, says the *Colorist*, be rendered much more durable without interfering with its luster, by giving it a coating with a warm mixture of 1 part of linseed oil and 2 of turpentine. To clean the gilding of fly specks, a mixture of 1 part of ammonia to 3 or 4 of water is recommended.

To Repair Luster Gilding.—Make a compound by melting Venetian turpentine, white wax and a little soap, over a moderate fire. Apply to the injured places with a brush. Let it remain for an hour, then lay on the gilding.

Water Gilding, upon Silver.—Pour strong vinegar on copper flakes; add alum and salt in equal quantities; set on a fire, and when the vinegar has boiled until it becomes ¼ part its original quantity, throw into the metal you design to gild, and it will assume a copper color. Continue boiling, and it will change into a fine gold color.

Steel, to Gild.—Polished steel may be beautifully gilded by means of the ethereal solution of gold. Dissolve pure gold in aqua regia, evaporate gently to dryness, so as to drive off the superfluous acid, redissolve in water, and add three times its bulk of sulphuric ether. Allow to stand for twenty-four hours in a stoppered bottle, and the ethereal solution of gold will float at top. Polished steel dipped in this is at once beautifully gilded; and by tracing patterns on the surface of the metal with any kind of varnish, beautiful devices in plain metal and gilt will be produced. For other metals the electro process is best.

Gilding, Varnish.—1. Beeswax, 4 oz.; verdigris and sulphate of copper, each 1 oz. *Mix.*

2. Beeswax, 4 oz.; verdigris, red ocher and alum, of each 1 oz.; *mix.* Used to give a red gold color to water gilding.

Ginger Beer. See **Beers.**

Ginger Pop.—One oz. tartaric acid; white sugar, 5 lb.; 1½ lb. bruised ginger (root); 12 gal. of water; whites of 6 eggs beaten to a froth; oil of lemon, 2 drm. The ginger root should be boiled for one half hour in 2 gals. of water; strain carefully and add the oil. After twenty-four hours strain and bottle.

Glaire.—Glaire may be made from the white of an egg beaten up with an egg beater. A little vinegar should be mixed with it before beating, and a drop of ammonia added as an antiseptic.

Glass.—*Bending Glass Tubes.*—1. Place the part where the curve is required in the flame of a spirit lamp or in an ordinary gas flame (the whole of the surface must be equally heated); when the glass begins to soften, a gentle pressure by the hands will give the necessary bend.

2. Fill them with sand; this is necessary in three cases: when the tube is very wide, when the glass is thin and when the curve is to be of a very long radius; in the latter case the tube filled with sand is best heated over a large furnace with burning charcoal.

Boring Glass. See *Drilling Glass*, below.

Bottle Glass.—*Sp. gr.*, 2·700 to 2·735.

a. Composition by analysis:

1. Silica, 53·55%; lime, 29·22%; mixed alkali, 5·48%; alumina, 6·01%; oxide of iron, 5·74%. Dark green.

2. Silica, 52%; baryta, 21·6%; soda, 26·1%; oxides of iron and manganese, 0·3%. Pale green; very superior.

b. Raw materials used:

1. Yellow sand, 20%; kelp, 8%; lixiviated wood ashes, 30%; fresh wood ashes, 8%; pale clay, 16%; cullet (broken glass), 18%. This is the common mixture for coarse bottles in Belgium, France and Germany.

2. To the last add of black oxide of manganese 2½ to 3%. This has a rich yellowish color; used for Rhenish wine bottles.

3. Pale sand, 51%; lixiviated wood ashes, 33%; pearl ashes (dried), 8%; common salt, 7½%; white arsenic, ½%; charcoal, q. s. Very pale green.

4. Siliceous sand (pale), 68½%; potash (or its equivalent), 4%; lime, 23½%; heavy spar, 2½%. peroxide of manganese, 1½%. This forms the famous flask glass of St. Etienne.

Glass, Cement for.—See **Cements.**

Glass, Chemical. Sp. gr. 2·390 to 2·396.

a. By analysis:

1. Silica, 72·80%; potassa, 16·80%; lime (with a trace of alumina) 9·68%; magnesia, 40%; traces of oxide of magnesia and iron (and loss), ·32%. This is the difficultly fusible Bohemian tube glass so valuable in chemical manipulations.

Glass to Clean.—If greasy, wipe with tow, then with nitric acid or caustic potash, rinse well. See also cleansing.

Glass Coating on Metals.—The following method has been suggested for coating metallic surfaces with glass: Take about 125 parts (by weight) of ordinary flint glass fragments, 20 of soda carbonate and 12 of boracic acid and melt. Pour the fused mass out on some cold surface, as of stone or metal, and pulverize when cooled off. Make a mixture of this powder with soda silicate (waterglass) of 50° B. With this coat the metal to be glazed and heat in a muffle or other furnace until it has fused. This coating is said to adhere very firmly to steel or iron.

Glass, Crayons to Write on. See **Crayons.**

Glass, Crown.—White window glass. Sp. gr. 2·486 to 2.488.

a. By analysis:

1. Silica, 62·8%; potassa, 22·1%; lime, 15·5%; alumina (with traces of oxide of iron and manganese), 2·6%. Crown glass of Bohemia according to Dumas. Very beautiful.

2. Silica, 72·5%; soda, 17·75%: lime, 9·75%; English crown glass; excellent quality, but not so white as the last.

b. Material used:

1. Finest white siliceous sand, 64%; purified potashes (dry), 23%; lime, 12%; white arsenic, ¾%; oxide of manganese, ¼%. Said to be used in Bohemia.

2. (Schweigger) pure sand, 57%; dry sulphate of soda, 28½%; quicklime, 11½%; powdered charcoal, 3 or 4%. Corresponds to *a* 2 above (nearly).

3. Pure sand, 40%; soda ash, 24%; lime, 5%; white cullet (broken glass fine), 31%. Rather superior to the last.

Crystal, Crystal Glass.—The crystal glass of England is flint glass of superior quality; that of Bohemia is noticed under Table Glass.

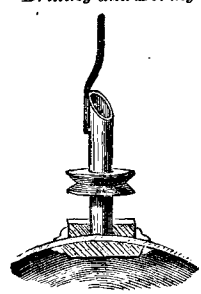
Cutting Glass Bottles.—This method consists in the use of what in German is called sprengkohle, cracking coal. The sprengkohle is made of finely ground limewood charcoal. The coal powder is transformed by means of sufficient gum tragacanth and water into a dough or paste, out of which small cylinders of the size of a pencil are made by rolling between two small pieces of board. Such a cylinder of sprengkohle, ignited at one end, glows slowly. Such sprengkohle may be bought at stores for chemical and physical necessities. Now as for the use of the sprengkohle, it is as follows: Put a drop of water on the spot where the crack is to begin. Make a short incision with a three edged file. *Wipe the water away. Touch* the incision with the glowing sprengkohle, blowing on it if required. After a few seconds the glass will crack for a length of ¼ to 1 in. If now you move slowly the sprengkohle, the crack follows it wherever you please.

Cutting Glass.—To cut glass well a fine diamond should be used and considerable skill is required in its use. The file and the red hot poker are also efficient means of cutting glass, the crack following the hot iron.

Glass, to Darken.—The following, if neatly done, renders the glass obscure yet diaphanous: Rub up, as for oil colors, a sufficient quantity of sugar of lead with a little boiled linseed oil, and distribute this uniformly over the pane from the end of a hog-haired tool by a dabbing, jerking motion, until the appearance of ground glass is obtained. It may be ornamented, when perfectly hard, by delineating the pattern with a strong solution of caustic potash, giving it such time to act as experience dictates, and then expeditiously wiping out the portion it is necessary to remove.

Glass, to Draw on.—Grind lampblack with gum water and some common salt; draw the design with a pen or hair pencil; or use a crayon made for the purpose.

Drilling and Boring Glass.—To drill a quarter inch hole in a glass shade make a hole in a piece of wood or metal of the size that you desire to drill in the glass. Fasten it with beeswax upon the glass for a guide. A piece of brass or copper tubing, quite thin, is supplied with emery (No. 100) and water and twirled between fingers, or with a bow string. This will cut a hole in a few minutes. You can feed the emery and water a little at a time through the tube. The sketch will give an idea as to the principle.



Glass, to Drill.—1. Can be done with a hard drill and spirits of turpentine—a tedious and uncertain process, and only for small holes. A diamond drill is much better and cheaper, if there are many holes to drill. If large holes are wanted, from ¼ in. to 1 in. or larger, prepare a piece of thin tubing of brass or copper, of the required size of hole, of 1 or 2 in. in length, with small spindle and grooved pulley attached, something after the style of the watch maker's bow drill. Fasten upon the plate of glass, at the point to be drilled, a ring of metal or wood for a guide to keep the tubular drill in its place, until the cut is started sufficiently to steady the cutter. Lay the glass plate horizontally, and work the drill perpendicularly with the bow, using one hand to steady the upper end of the drill stock. Feed emery (about No. 90) and water into the open end of the tube as fast as required. In a very short time you will cut a disk out of the plate.

2. For drilling holes in glass, a common steel drill, well made and well tempered, the *Glassware Review* claims to be the best tool. The steel should be forged at a low temperature, so as to be sure not to burn it, and then tempered as hard as possible in a bath of salt water that has been well boiled. Such a drill will go through glass very rapidly if kept well moistened with turpentine in which some camphor has been dissolved. Dilute sulphuric acid is equally good, if not better. It is stated that at Berlin glass castings for pump barrels, etc., are drilled, planed, and bored like iron ones, and in the same lathes and machines, by aid of sulphuric acid. A little practice with these different plans will enable the operator to cut and work glass as easily as brass or iron.

3. The following directions were contributed to *Design and Work* by an optician: First make a saturated solution of camphor in spirits of turpentine; then make a spear-shaped drill the size of hole required; heat the drill to a white

heat and plunge into mercury, and it will then be very hard; sharpen on an oilstone, knock drill in a bradawl handle, dip the end of drill into the above solution, and work it as if you were working it through wood. It is no use fixing the drill in a drillstock, because the motion all one way will not do. Keep the drill well moistened with the solution, and sharpen it when blunt. A file dipped into solution will file the hole larger, and will not get blunt. See also **Hardening.**

Embossing Glass. See **Gilding** (*Embossing*).

Etching Glass. See **Etching.**

Flint Glass.—The following quantities form a very excellent glass

Fine white sand.....	....300 parts.
Red lead or litharge.....	....200 parts.
Refined pearlashes	80 parts.
Niter.....	20 parts.

Arsenic and manganese, a small quantity.

Glass, Flint, Crystal.—Sp. gr. 3·000 to 3·620.

a. By analysis:

1. (Berthier.) Silica, 59·19%; oxide of lead, 28·68%: potassa, 12·13%; oxides of iron and manganese, traces. Finest colorless English crystal.

2. (Brande: Faraday.) Silica, 52%; oxide of lead, 34%; potassa, 34%. Crystal.

3. (Faraday.) Silica, 44·30%; oxide of lead, 43·05%; potassa, 11·75%; alumina, 0·50%; oxides of iron and manganese, 0·12%; (loss 28%).

Heaviest of three samples of flint glass examined.

b. Materials used:

1. Finest Lynn sand (calcined, sifted and washed), 0·51%; litharge (purest), 28% (or red lead, 29%); refined pearlashes (calcined before being weighed), 16%; niter (purified), 4¾%; arsenious acid and peroxide of manganese, of each ⅛%. Very fine crystal.

2. (M. Payen.) Fine sand, 46%: red lead, 31%; purified carbonate of potash, 23%. French crystal.

3. (Geddes.) White Lynn sand, 51%; red lead or litharge, 33%; refined pearlashes, 13%; niter, 3%; a very little arsenious acid and peroxide of manganese. Ordinary English flint glass. Crystal cullet may be added at will to the above. This glass was originally prepared from powdered flints, a fact to which it owes its common name.

Glass, Optical.—1. (Crown glass.) Purest silicious sand, 55%; carbonate of soda (dry), 12%; chalk (dry), 11%; carbonate of baryta, 22%.

Frosting Glass.—1. Rub over with a little bag of muslin filled with fine sand, powdered glass, or grindstone grit and water. Some sand may be placed directly on the glass.

2. Clean the windows thoroughly and moisten with hydrofluoric acid. When frosted enough wash thoroughly.

Glass, to Gild. See **Gilding.**

Grinding Glass Tube.—It is very easy to true the interior of glass tube by chucking same (cemented hot by pitch) into a true hole bored by a slide rest in a wooden carver's chuck, attached to a lathe face plate. Then grind out with fine emery the interior by sliding a rod of steel one-third less diameter, fixed firmly and truly in the slide rest tool holder, so as to just bear upon the descending side of the inner tube, as the former moves in and out, and is constantly supplied with plenty of water and fresh emery. Polish by wrapping a few thicknesses of alpaca or linen round the steel, and use finely washed rouge. This is the only way to get a perfectly true barrel.

Ground Glass.—The frosted appearance of ground glass may be very nearly imitated by gently dabbing the glass over with a piece of glazier's putty, stuck on the ends of the fingers. When applied with a light and even touch, the resemblance is considerable. Another method is to dab the glass over with thin white paint, or flour paste, by means of a brush; but this is much inferior to the former. Used for windows.

Imitation Ground Glass.—A very useful kind of varnish is made known by Leon Vidal, which is excellent for producing imitation of ground glass, and will doubtless be found available for other purposes. The formula is: Sandarac, 18 parts; mastic, 4 parts; ether, 200 parts; benzol, 80 to 100 parts.—*Illustrated Scientific News.*

Imitation Ground Glass that Steam will not Destroy.—Put a piece of putty in muslin, twist the fabric tight and tie it into the shape of a pad; well clean the glass first, and then pat it over. The putty will exude sufficiently through the muslin to render the stain opaque. Let it dry hard and then varnish. If a pattern is required cut it out in paper as a stencil; place it so as not to slip and proceed as above, removing the stencil when finished. If there should be any objection to the existence of the clear spaces, cover with slightly opaque varnish.

Ground Glass Substitute.—Use gutta percha dissolved in chloroform.

Glass, to Cut Large Holes in.—1. Bore a hole in the center by means of a hard steel drill moistened with turpentine; cut the circle with a good glazier's diamond guided by a small piece of copper wire centered in the hole just bored, and by means of cuts radiating from the center to the circumference divide the circle into numerous small sectors. Then, with a small piece of metal, tap the glass on the posterior side gently, following each cut throughout its extent. When this has been properly done, fasten a piece of putty over the area of the circle on the cut side of the glass; and, while holding the putty, tap the glass on the other side firmly in the center of the circle. Too much pressure on the diamond will cause it to scratch without cutting the glass.

2. *New Remedies* describes the following easy method of making a hole in plate glass: Make a circle of clay or cement rather larger than the intended hole, pour some kerosene into the cell thus made, ignite it, place the plate upon a moderately hard support, and with a stick rather smaller than the hole required, and a hammer, strike a rather smart blow. This will leave a rough edged hole, which may be smoothed with a file. Cold water is said to answer even better than a blow. See also *Drilling* and *Boring Glass* above.

Ornamenting Glass.—J. B. Miller contributes to *Neuste Erfindung* a description of a rapid and practical method of printing designs or labels on glass. The ink employed consists of 90 parts of French oil of turpentine, 30 parts of Burgundy pitch, 10 parts of pulverized Syrian asphalt and 2 parts of pulverized mastic. These are boiled together and form a pasty varnish, which is spread out on a plate of ground glass, from which it is transferred to the rubber type by means of a rubber roller. The ink must not be put on too thick. The glass is printed with this ink, and then dusted over with finely pulverized Syrian asphalt and heated in a sheet iron muffle until the ink and asphalt unite to form a brilliant varnish. If the glass is to be deeply etched the dusting with asphalt must be repeated.

If the whole glass is not to be rendered matt, the remainder is covered, with the exception of a round or oval vignette, with a mixture of 1 part stearine and 2 or 3 parts tallow. It is then put in lye, and the part that is to be etched is well washed with water, when the glass is put in dilute hydrofluoric acid for five minutes, rinsed with water and put in the matt bath, where it is left fifteen or twenty minutes. It is afterward cleansed with hot lye and polished.

Painting on Glass.—Clear resin, 1 oz.; melt in an iron vessel, let cool a little, but not harden, then add oil of turpentine sufficient to keep it

in a liquid state. When cold, use it with colors ground in oil.

Glass Paper. See **Paper.**

Glass, Photographic, to Remove the Films from.—To 8 oz. of water add 10 minims of hydrofluoric acid; pour the mixed solution in a rubber tray, immerse in the solution one negative at a time. In about a minute the film will loosen at the edges, and with a flat wood stick may be rolled up off the plate and removed bodily. Negative after negative may be thus easily cleansed. Keep the fingers from touching the solution as much as possible. Another method is to soak the plates in a hot dilute sal soda solution, which will dissolve out the film:

Glass for Photographic Use.—If the glass is new, clean with nitric acid and tripoli; if old, and there is a film adhering, boil in a solution of caustic potash.

Glass, Plate.—Sp. gr. 2·488 to 2·600.

a. By analysis:

1. (Dumas) Silica, 75·9%; soda, 17·5%; lime, 3·8%; alumina, 2·8%. French mirror glass.

2. (Mitscherlich.) Silica, 60%; potassa, 25%; lime, 12·5%; loss, 2·5 (%). Finest Bohemian plate.

b. Materials used:

1. Finest siliceous sand, 45%; dried carbonate of soda, 25%; lime, 5%; niter (purified), 2%; plate glass cullet, 23%; peroxide of manganese and cobalt azure, a very little. Ordinary English plate.

2. Whitish quartz sand, 60%; purified carbonate of soda (dried), 20%; lime (slaked by exposure to the air), 9%; plate glass cullet, 11% (or more). Sometimes as much cullet as sand is used; but in all cases 1% to 1½% of its weight in carbonate of soda is added with it besides that ordered in the formula, to compensate for the loss of alkali by remelting. Used at the celebrated plate glass works at Saint-Gobain, France. The product possesses an amount of excellence which British manufacturers have yet failed to equal.

Glass, to Powder.—Make a piece of glass red hot in the fire, and while in this state plunge it into cold water; it will immediately break into powder; this must be sifted and dried; it is then fit for making glass paper, for filtering varnishes, and for other purposes.

To Prepare Ruby Colored Glass.—We find reported in the *American Journal of Photography* the following formula given by Mr. Bell before a meeting of the Philadelphia Photographic Society:

Dissolve in—

Water	6 oz.
Heinrich's gelatine	150 grn.
Chloride of ammonium	3 grn.

To the above solution is added the following solution:

Water	½ oz.
Nitrate of silver	30 grn.

The new solution thus made is warmed to a temperature of 100° F., and flowed on a glass plate, previously warmed. One oz. is sufficient to cover a 10 by 12 plate.

After coating, place the glass on a level marble slab or glass plate to set and dry. When dry expose to sunlight, and the color will change to a beautiful orange ruby exactly suitable for dark room illumination.

Rupert's Drops are made by letting drops of melted glass fall into cold water; the drop assumes by that means an oval form with a tail or neck resembling a retort. They possess this singular property, that if a small portion of the tail is broken off the whole bursts into powder with an explosion, and a considerable shock is communicated to the hand that grasps it.

Rust, Removal of from Window Glass.—Try a mixture of 30 parts of water with 7 of hydrochloric acid and a trace of iodine. Rub the plate with a linen rag moistened with the fluid and then polish.

Scratches on Glass, to Remove.—Slight scratches may be partially polished out by rubbing the part with rouge wet with water upon a piece of soft leather. If it is a deep scratch, it will have to be ground out with the finest flour emery, such as is used by opticians, and the spot polished with rouge and water upon a piece of soft leather. If you have much of this kind of work to do, it will save time to set up a buff wheel made of wood and grind out the scratches with fine pumice stone and water. Then polish with a felt buff and rouge with water.

Glass Staining.—Use colors which come prepared especially for this purpose, as it hardly pays to prepare them, and the results are much more uniform. In general the colors are rubbed up on glass with spirits of turpentine or lavendar and applied to the glass, which has previously been sponged with gum water, to give it a slight tooth. Considerable skill and many attempts must be made before satisfactory work can be done. When the painting is finished each piece is fired in a muffle and is laid in a bed of sifted lime. Great skill is required in the firing and no general directions can be given. It is a much better plan to send the pieces to a man who makes a specialty of firing glass.

Glass, to Silver. See **Silvering.**

Glass, Soluble.—Water glass. An impure alkaline silicate.—Silica, 1 part; carbonate of potassium or of sodium 2 parts fused together.

Carbonate of sodium (dry), 54 parts; carbonate of potassium (dry), 70 parts; silicia, 192 parts, as last. Soluble in boiling water, yielding a fine transparent semi-elastic varnish. Carbonate of potassium (dry), 10 parts; powdered quartz (or sand free from iron and alumina), 15 parts; charcoal, 1 part; fused together. Soluble in 5 or 6 times its weight of boiling water, and the filtered solution evaporated to dryness, yields a transparent glass, permanent in the air.

Glasses, to Tune.—(To play on with the palm of the hand.) The tones are dependent on the glasses and the amount of water used. Moisten the palm of the hand with water. Some use a little glycerine.

Glass, Varnish for. See **Varnishes.**

Glass, Window.—Broad, Spread. Sp. gr. 2·642.

a. By anlysis: Silica, 69·70%; lime, 13·30½%; soda, 15·25%; oxide of iron (and loss), 1·75%.

b. Materials used: 1. White sand, 50%; dried sulphate of soda, 22%; charcoal (in powder), 9%; cullet (broken glass), 41%; peroxide of manganese, a little. Pale blue. 2. White sand, 60%; potashes (good), 24%; common salt, 10%; niter, 5%; white arsenic, 1%; peroxide of manganese, a little ($\frac{1}{2}$ to $\frac{1}{10}$); pale cullet (broken glass), at will (10 to 30%). This is the spread or sheet window glass in common use.

2. Flint Glass.—*a.* By analysis: Silica, 44·30%; oxide of lead, 43·05%; potassa, 11·75%. This is Guinand's dense optical glass.

b. Materials used: 1. Purest quartz, 42%; red lead (finest), 42%; purified potash, 14¾%; purified niter, 1¼%. These are the proportions used for the last. 2. (Korner.) Finest quartz (reduced to powder and treated with hydrochloric acid, washed and dried), 47½%; red lead, 38½%; cream of tartar, 14½%. The above are used by opticians in the construction of achromatic object glasses.

Glass, to Write on.—1. Ether, 500 grn.; sandarac, 30 grn.; mastic, 30 grn. Dissolve, then add benzine in small quantities till the varnish, spread on a piece of glass, gives it the aspect of roughened glass. The varnish is used cold. To have a homogeneous layer, pour over that already formed, some oil of petroleum, let it evaporate a little, then rub in all directions

with cambric cloth till all is quite dry. With ink or lead pencil, lines can be produced on this surface as fine as may be desired Thus a drawing may be prepared in a few minutes and immediately projected.—*Crova.*

2. The glass is to be first gently heated at a spirit lamp or gas flame, till steam ceases to be deposited on it, *up to* 112° or 140° F. (44° *to* 60° C.). Then a particular varnish should be poured upon it, as is done in photographic operations with collodion. This varnish is composed of 51 dwt. alcohol, 61 grn. mastic in drops, and 122 grn. pounce. The resins are dissolved by being heated in a hot water bath, the whole being in a flask corked and fastened. The *solution* is afterward filtered. The varnish is very hard, and becomes brilliant and completely transparent. If it is poured on the cold glass, it becomes opaque and absorbs ink. Drawings may be executed upon it with common or Indian ink. Then a thin layer of gum is put upon it by dipping the glass in a very diluted solution of gum or any other non-alcoholic coating. This process might be advantageously employed instead of labels on bottles in laboratories, and for making figures on glass, and perhaps for tracing drawings, which might thus be reproduced by photography.—*Terquem.*

3. A mixture of flour, ammonia hydrate, and hydrochloric acid, thickened with gum acacia, forms an ink by which, with a pen, letters or ornaments may be traced on glass, where they will become permanent.

4. Faber makes pencils for writing upon glass, porcelain, metal, etc., as follows: Black—10 parts lampblack, 40 white wax, 10 of tallow.

5. White—40 white lead, 20 wax, 10 tallow.

6. Blue—10 Berlin blue, 20 wax, 10 tallow.

7. Dark blue—15 Berlin blue, 5 gum arabic, 10 tallow.

8. Yellow—10 chrome yellow, 20 wax, 10 tallow.

9. A varnish of sugar is recommended. It is made by dissolving equal parts of white and brown sugar in water to a thin *sirup*, adding alcohol, and apply to hot glass plates. The film dries very readily, and furnishes a surface on which it is perfectly easy to write with a pen or pencil.

10. Coachmaker's black japan is the article used by gilders on glass. Black japan can be thinned with turpentine; and as to being too transparent, there must be some mistake. However, gilders use two or three coats to get dense black, and wash off part of one to make the shadow fall away when such an appearance is required.

Glazes.—*Porcelain Glaze.*—Forty parts Cornish stone, 45 parts red lead, 38 parts borax, 32½ parts flint, 22½ parts flint glass, 13 parts crystal of soda, 5 parts oxide of tin, 1 part enamel blue. The particles are made small and well mixed together, then calcined in the coolest part of the glazing oven, in seggars thickly lined with flint; care must be observed that the frit is not too highly calcined, or brought into a high state of vitrification; if so, it will render it difficult to grind, and injure its good qualities in dipping. The frit likewise if too finely ground will cause the glaze to be uneven on the surface of the ware; if any inconvenience of this nature arises, by adding a solution of potash in hot water, that defect will be instantly obviated.

Ironstone Glaze.—Thirty-six parts Cornish stone, 30 parts borax, 20 parts flint, 15 parts red lead, 6 parts crystallized soda, 5 parts oxide of tin, ½ part blue calx. With the above frit is to be added 15 parts white lead, 10 parts Cornish stone, 10 parts flint; when ground together, the composition is ready for use; should the glaze prove too thin for dipping, add a small quantity of muriatic acid.

Body Frit.—Sixty parts Cornish stone, 40 parts flint, 30 parts crystallized soda, 8 parts oxide of tin, 10 parts borax. This frit is used in small quantities, in china and ironstone bodies.

Frit for Glazes.—1. Forty parts Cornish stone, 36 parts flint glass, 20 parts red lead, 20 parts flint, 15 parts potash, 10 parts white lead, 3 parts oxide of tin. This frit is intended to be used in glazes, in lieu of those which contain a large proportion of borax; therefore, by substituting it when the price of that article is high, will, of course, be advantageous, and the texture of the glaze will still be good and admissible.

2. Thirty-six parts Cornish stone, 30 parts red lead, 20 parts flint, 20 parts borax, 15 parts crystal of soda, 5 parts oxide of tin. These two frits may be calcined in the easy part of the glazing oven, in seggars lined with flint; particular care should be observed that they are clean chipped, and free from pieces of seggars, or any dirty substance.

Earthenware, Printed Glaze, Superior.—Ninety parts white lead, 35 parts Cornish stone, 20 parts flint glass, 20 parts flint, 60 parts frit (for glazes 2 parts), ¼ part blue calx.

Common.—Eighty-five parts white lead, 35 parts Cornish stone, 22 parts flint, 15 parts flint glass, 24 parts frit (for glazes 2 parts), ½ part blue calx. These glazes, when ground, to be sifted through a fine lawn; the former glaze is of the finest texture, and will require rather a thinner coating when dipped than those of common glazes. Fire in seggars, either washed with common glaze or a mixture of lime and slip without flint.

Common Printed Glaze.—Ninety parts white lead, 45 parts Cornish stone, 22 parts flint, 20 parts flint glass, ¼ part blue calx. To this, after being properly ground and sifted, add 1 lb. of common salt and ½ lb. of borax, which forms a smear or flow, as it is generally termed, but must not be put into the glaze until the blue stain is perfectly incorporated with it; the ware dipped therein must be placed in seggars washed with glaze.

White Earthenware Glaze.—Thirty-five parts Cornish stone, 20 parts borax, 10 parts crystal of soda, 20 parts red lead, ⅛ part blue calx. Calcine and then pulverize coarsely, and grind with 20 lb. white lead, 10 lb. Cornish stone, and 5 lb. flint.

Blue and Green Edge Glaze.—Seventy-two parts litharge, 36 parts Cornish stone, 20 parts flint glass, 17 parts flint, 12 parts frit (for glazes, 2 parts), ½ part blue calx. The blue and green edged ware when dipped in this glaze should be perfectly dry previous to being placed in the seggars, and the green edge should be seated in the coolest part of the glazing oven.

Cream Color Glaze, Superior.—Eighty-five parts white lead, 40 parts Cornish stone, 22 parts flint, 16 parts flint glass, 8 parts frit (for glazes, 2 parts).

Common.—Seventy-five parts litharge, 40 parts Cornish stone, 23 parts flint, 10 parts flint glass.

Brown Cottage Glaze.—Sixty parts litharge, 32 parts flint, 8 parts brown slip. This and the two following glazes require using about the same consistency as the cream color glaze, and will stand the highest temperature of heat in a common glazing oven.

Calcedony Glaze.—Sixty-five parts litharge, 40 parts Cornish stone, 20 parts flint, 6 parts frit (for glazes, 2 parts).

Drab Glaze.—Seventy parts litharge, 30 parts flint, 25 parts Cornish stone, 10 parts drab slip.

Blue Glaze.—Fifty parts flint, 30 parts borax, 22 parts red lead, 10 parts Cornish stone, 6 parts crystallized soda, 6 parts oxide of tin, 3 parts blue calx. In preparing this glaze follow the same directions as for porcelain glaze.

Harmless Glaze.—A harmless glaze for earthenware, destined to replace the lead glazes hitherto employed, has lately been devised by M. Constantin. One recipe is 100 parts silicate of soda, 15 parts powdered quartz and 25 parts Meudon chalk. Another is the same with the addition of 10 parts of borax. The articles

glazed can be colored by copper for green and manganese for brown.

Tobacco Pipes, Glaze for.—1. Make a saturated solution of sugar of lead (lead acetate) in hot water. Dip the pipes in this, or apply it with a brush to the outside, then dry and expose in an open muffle at a low red heat until properly glazed.

2. Potassium carbonate, 1 part; borax, 5 parts; melt together in a sand crucible and pour out on an iron plate to cool, then powder and mix into a paste with a little turpentine oil for use. Apply with a brush or clean rag, and heat slowly in a muffle or oven to incipient redness.

English for Earthenware.—Quartz or glazing sand, 28 parts; silver litharge, 40 parts; pipe clay, 18 parts; best manganese oxide, 9 parts; chalk, 5 parts. Melt into a frit and grind finely.

Glazing.—In ceramics the term is used to denote a covering of the ware with a thin coating of natural or artificial glass to protect the soft body and to render it impervious to liquids.

Gloves, *to Clean.* See **Cleansing.**

Gloves.—*Cosmetic.* See **Cosmetics.**

Gloves.—*Kid, to Prevent Perspiring.*—A little dry corn starch or pulverized soapstone put on the hands in warm weather will prevent any perspiration injuring kid gloves.

Glove Powder. See **Powders.**

Glue, to Bleach. See **Bleaching.**

Glue Cements. See **Cements.**

Glues. See also **Cements, Mucilages** and **Pastes.**

Glue is a cement used for joining pieces of wood together, and has for its chief constituent a substance called gelatine, obtained from the cuttings of hides, skins, tendons and other refuse parts of animals, as well as from cuttings of leather and parchment, which, after being well soaked in milk of lime, to dissolve any blood, flesh or fat, are thoroughly washed in a stream of water to remove the lime. The material is then boiled in water until the required adhesive strength is obtained, when the liquid is run off into a cistern and clarified with powdered alum, which precipitates in the form of sulphate any lime that may remain, as well as other impurities. Before cooling it is drawn off into moulds, and is then in the form of size, which, when cut into slices and dried in the air, hardens into glue.

Hints about Glue.—Good glue should be a light brown color, semi-transparent, and free from waves or cloudy lines. Glue loses much of its strength by frequent remelting; therefore, glue which is newly made is preferable to that which has been reboiled. The hotter the glue the more force it will exert in keeping the joined parts glued together. In all large and long joints it should be applied immediately after boiling. Apply pressure until it is set or hardened.

The following, translated from *Des Ingenieurs Taschenbuch*, contains a great deal of valuable information which will probably be acceptable to many of our readers.

Common Glue.—The absolute strength of a well glued joint is:

	Pounds per square inch.	
	Across the grain, end to end.	With the grain.
Beech	2,133	1,095
Elm	1,436	1,124
Oak	1,735	568
White wood	1,493	341
Maple	1,422	896

It is customary to use from one-sixth to one-tenth of the above values, to calculate the resistance which surfaces joined with glue can permanently sustain with safety.

Bank Note or Mouth Glue.—Is made by dissolving 1 lb. of fine glue, or gelatine, in water, evaporating it till most of the water is expelled, adding ½ pound brown sugar, and pouring it into moulds. Some add a little lemon juice. It is also made with 2 parts of dextrine, 2 of water and 1 of spirit.

Bookbinders' Glue.—Use best carpenters' or white glue, to which, after soaking and heating, one-twentieth its weight of glycerine is added.

Glue, of Caseine.—1. (Braconnet.)—Dissolve caseine in a strong solution of bicarbonate of soda. 2. (Wagner.)—Dissolve caseine in a cold saturated solution of borax. Superior to gum, and takes the place of glue in many cases. May be used for backs of adhesive tickets.

Glue Cement. See **Cements.**

Compound Glue, to Make.—Take very fine flour, mix it with white of eggs, isinglass and a little yeast; mingle the materials and beat them well together; spread them, the batter being made thin with gum water, on even tin plates and dry them in a stove, then cut them out for use. To color them tinge the paste with Brazil or vermilion for red; indigo or verditer, etc., for blue; saffron, turmeric or gamboge, etc., for yellow.

Cracking, to Prevent Glue from.—1. Glue frequently cracks because of the dryness of the air in rooms warmed by stoves. An Austrian contemporary recommends the addition of a little chloride of calcium to glue to prevent this disagreeable property of cracking. Chloride of calcium is such a deliquescent salt that it attracts enough moisture to prevent the glue from cracking. Glue thus prepared will adhere to glass, metal, etc., and can be used for putting on labels without danger of their dropping off.

2. Add a very small quantity of glycerine to the glue. The quantity must be modified according to circumstances.

Damp Wood, Glue for.—1. Soak pure glue in water until it is soft; then dissolve it in the smallest possible amount of proof spirit by the aid of a gentle heat. In 2 oz. of this mixture dissolve 10 gr. of gum ammoniacum, and while still liquid add ½ drm. of mastic dissolved in 3 drm. of rectified spirit. Stir well and keep the cement liquefied in a covered vessel over a hot water bath. It is essentially a solution of glue in mastic varnish.

2. Shellac, 4 oz.; borax, 1 oz.; boil in a little water until dissolved and concentrate by heat to a paste.

Elastic Glue which does not spoil is obtained as follows: Good common glue is dissolved in water, on the water bath, and the water evaporated down to a mass of thick consistence, to which a quantity of glycerine, equal in weight with the glue, is added, after which the heating is continued until all the water has been driven off, when the mass is poured out into the moulds or on a marble slab. This mixture answers for stamps, printer's rolls, galvano-plastic copies, etc.

Ether Glue.—Dissolve glue in nitric ether. The ether will only dissolve a certain amount of glue, therefore the solution cannot be made very thick; it will be about the consistency of molasses, and is much more tenacious than glue made with hot water. It is improved by adding a few bits of India rubber, cut into pieces about the size of a buckshot. Let the solution stand a few days, stirring frequently.

Fireproof Glue.—Mix a handful of quicklime in 4 oz. of linseed oil, boil to a good thickness; then spread on tin plates in the shade, and it will become exceedingly hard, but may be easily dissolved over the fire and used as ordinary glue.

Flower Pots, Glue for Cementing Labels on.—Use thin paper for label and attach with white

gelatine in solution, to which has been added one per cent. of bichromate of potash. This must be done in a dark or obscure room. Then expose the labels to sunlight. After writing, varnish with solution of shellac in alcohol.

Frozen Glue.—The glue while gelatinous is sliced, placed on nets and allowed to freeze by natural cold. Of course the process can only be conducted in cold weather. The product is porous and much more bulky than hard glue, but is a better article, as it dissolves more easily. It sells largely in New England, where it is preferred by buyers to the hard glue.

Glass to Wood, Glue for Joining.—Finely sifted wood ashes are added to glue when hot; use immediately.

Glue for Repairing Glass.—Dissolve fine glue in strong acetic acid to form a thin paste.

Hardening Glue.—Try a little finely powdered brick dust, which will harden quickly in proportion to the quantity used.

Insoluble Glue. See Waterproof Glues below.

Isinglass Glue.—Dissolve isinglass in water and strain it through coarse linen. Then add a little alcohol and evaporate to such a consistency that when cold it will be dry and hard. This will be found to be more tenacious than common glue and therefore preferable in many cases.

Ivory and Bone, Glue for.—Isinglass is boiled in water until very thick, when enough zinc white is added to make the whole the consistency of molasses.

Labels, to Glue to Iron.—Make a paste of rye flour and glue. Add linseed oil varnish and turpentine, ½ oz. of each to the pound of the paste.

Sticking Labels to Tinned Plate.—From the *Chemists' and Druggists' Diary* for 1879, p. 188, the following seven methods of making a cement for affixing paper to tin:

1. Add to ordinary paste a little honey or glycerine.
2. Add muriatic acid to the gum; this is apt to cause the metal to rust under and around the label.
3. Add a litte ammonia, or,
4. Tartaric acid to the starch paste or mucilage.
5. Add aluminum sulphate (not alum) to the mucilage.
6. The best plan is said to be to add 20 drops of a solution of chloride of antimony to 8 oz. of paste of mucilage.

Leather, to Glue to Iron.—There is a constant inquiry as to the best plan for fastening leather to iron, and there are many recipes for doing it. But probably the simplest mode, and one that will answer in a majority of cases, is the following: To glue leather to iron, paint the iron with some kind of lead color, say white lead and lamp black. When dry, cover with a cement made as follows: Take the best glue, soak it in cold water till soft, then dissolve it in vinegar with a moderate heat, then add ⅛ of the bulk of white pine turpentine, thoroughly mix, and by means of the vinegar make it of the proper consistency to be spread with a brush, and apply it while hot; draw the leather on quickly, and press it tightly in place. If a pulley, draw the leather round tightly, lap, and clamp.

Leather Goods, Glue for.—This glue, though rather complex in composition, gives good results. Eight oz. of rye whisky are diluted with 8 oz. of water and the mixture is made into a paste with 2 oz. of starch, ¾ of an oz. of good glue are dissolved in the same amount of water, an equal amount of turpentine is added and the mixture and the paste are combined.

Leather, etc., to Metals.—One part crushed nut galls digested six hours with 8 parts distilled water and strained. Glue is macerated in its own weight of water for twenty-four hours, and then dissolved. The warm infusion of nut galls is spread on the leather; the glue solution upon the roughened surface of the warm metal; the moist leather is then pressed upon it and dried.

Liquid Glues.—1. A liquid glue possessing great resisting power, recommended for wood and iron, is prepared, according to Hesz, as follows: Clear gelatine, 100 parts; cabinetmakers' glue, 100 parts; alcohol, 25 parts; alum, 2 parts; the whole mixed with 200 parts of 20% acetic acid, and heated on a water bath for six hours. An ordinary liquid glue, also well adapted for wood and iron, is made by boiling together for several hours 100 parts glue, 260 parts water, and 16 parts nitic acid.—*English Mechanic.*

2. An improved liquid glue, according to the *Journal of Applied Chemistry*, may be prepared by dissolving 3 parts of glue, broken into small pieces, in 12 to 15 parts of saccharate of lime. On warming, the glue dissolves rapidly, and remains liquid when cold, without losing its strength. Any desirable consistency may be secured by varying the amount of saccharate of lime.

3. Two oz. gelatine, 4 oz. water; when the gelatine has fully swelled, add 2 oz. glacial acetic acid. It is capital for mending china, glass, etc.—*A. Pumphrey.*

4. Liquid Glue without Acid.—An excellent liquid glue is made thus: Take of best white glue, 16 oz.; white lead, dry, 4 oz.; rain water, 2 pt.; alcohol, 4 oz. With constant stirring dissolve the glue and mix the lead in the water by means of a water bath. Add the alcohol, and continue the heat for a few minutes. Lastly, pour into bottles while it is still hot.

5. Take a wide mouthed bottle, and dissolve in it 8 oz. best glue in ½ pt. water, by setting it in a vessel of water, and heating until dissolved. Then add slowly, 2½ oz. strong aquafortis (nitric acid), 36° Baumé, stirring all the while. Effervescence takes place under generation of nitrous acid. When all the acid has been added, the liquid is allowed to cool. Keep it well corked, and it will be ready for use at any moment.

6. Take of best white glue, 16 oz.; white lead, dry, 4 oz.; rain water, 2 pt.; alcohol, 4 oz.; with constant stirring, dissolve the glue and lead in the water by means of a water bath. Add the alcohol and continue the heat for a few minutes. Lastly pour into bottles while hot.

7. Take 1 pt. of the common turpentine and mix in a quart bottle with 4 fl. oz. 98% alcohol. Agitate well, and let stand until the two fluids separate. Decant the turpentine (which will form the lower layer) from the alcohol, and mix it with 1 pt. clear water. Agitate thoroughly, and let stand until these two fluids separate, then from the water decant the turpentine (which this time will form the upper layer), and, finally, mix with the turpentine about 1 oz. powdered starch, and filter through paper.

8. Lehner publishes the following formula for making a liquid paste or glue from starch and acid. Place 5 lb. potato starch in 6 lb. water, and add ¼ lb. pure nitric acid. Keep it in a warm place, stirring frequently for forty-eight hours. Then boil the mixture until it forms a thick and translucent substance. Dilute with water, if necessary, and filter through a thick cloth. At the same time another paste is made from sugar and gum arabic. Dissolve 5 lb. gum arabic and 1 lb. sugar in 5 lb. water, and add 1 oz. nitric acid and heat to boiling. Then mix the above with the starch paste. The resultant paste is liquid, does not mould, and dries on paper with a gloss. It is useful for labels, wrappers, and fine bookbinders' use. Dry pocket glue is made from 12 parts glue and 5 parts sugar. The glue is boiled until entirely dissolved, the sugar dissolved in the hot glue, and the mass evaporated until it hardens on cooling. The hard substance dissolves rapidly in lukewarm water, and is an excellent glue for use on paper.—*Polytech. Notiz.; Pharm. Record.*

9. Cut 6 parts glue in small pieces. Pour 16 parts water over it, allow it to stand for a few hours. Add 1½ part sulphate of zinc, 1 part hydrochloric acid gas. Keep the mixture at a temperature of 175° to 190° F. for ten or twelve hours. This glue may be used for joining all articles, even porcelain, glass, mother of pearl, etc. It does not congeal.

10. Take of best white glue, 16 oz.; white lead, dried, 4 oz.; rain water, 2 pt.; alcohol, 4 oz. Dissolve the glue and lead in the water by means of a water bath, stirring constantly. Add the alcohol, and continue the heat for a few minutes. Pour into bottles while it is hot.

11. Very Strong Liquid Glue.—Glue, 4½ parts; water, 12 parts. Let them stand several hours. To soften the glue: Add muriatic acid, ¾ parts; sulphate of zinc, 1½ part. Heat the mixture to 185° F. for ten or twelve hours. This glue remains liquid after cooling. Used for sticking wood, crockery, and glass.

12. Russian Liquid Glue.—Soften 50 parts best Russian glue in 50 parts warm water. Add, slowly, from 2¾ to 3 parts aquafortis and 3 parts powdered sulphate of lead.

Marine Glue.—1. Although now far from new, the extremely valuable marine glue, of Jeffrey, does not seem to be as well known in this country as it deserves. Prepared by dissolving 1 part India rubber in crude benzine, and mixing with 2 parts shellac by the aid of heat. The waterproof character of this cement, in connection with its slight elastic flexibility, the ease with which it is applied when warm, and the promptness with which it sets on cooling, make it a most useful substance in many applications to house construction and furniture, as well as on board ship, where it was originally intended to be chiefly employed.

2. Caoutchouc, 1 oz.; genuine asphaltum, 2 oz.; benzole or naphtha, q. s. The caoutchouc is first dissolved by digestion and occasional agitation, and the asphaltum is gradually added. The solution should have about the consistency of molasses.

3. Take of coal naphtha, 1 pt.; pure (not vulcanized) rubber, 1 oz.; cut in shreds; and macerate for ten or twelve days, and then rub smooth with a spatula on a slab; add at heat enough to melt, 2 parts shellac by weight, to 1 part of this solution. To use it, melt at a temperature of about 248° F.—*E. H. H., of Mass.*

4. Elastic Marine Glue.—Dissolve unvulcanized rubber in chloroform, benzole or bisulphide of carbon. Ropes or other material exposed to the action of air and water are coated with this glue. Whiting or fine sand may be added.

Glue, Hints in Melting and Using. — The hotter the glue, the more force it will exert in keeping the two parts glued togother; therefore, in all large and long joints, the glue should be applied immediately after boiling. Glue loses much of its strength by frequently remelting; that glue, therefore, which is newly made is much more preferable to that which has been reboiled.

A Glue to Resist Heat or Moisture.—Mix a handful of quicklime in ¼ lb. of linseed oil; boil them to a good thickness and then spread it on a slab to cool.

Moisture Proof Glue.—Moisture proof glue is made by dissolving 16 oz. of glue in 3 pt. of skim milk. If a still stronger glue be wanted, add powdered lime.

Parchment Glue.—Parchment, 10 parts, is cut into small pieces and boiled in 128 parts water until the liquid is reduced to 80 parts. The decoction is filtered through linen, and evaporated over a gentle fire until it presents the required consistence.

Dry Pocket Glue.—Dry pocket glue is made from 12 parts of glue and 5 parts of sugar. The glue is boiled until entirely dissolved, the sugar dissolved in the hot glue, and the mass evaporated until it hardens on cooling. The hard substance dissolves rapidly in lukewarm water, and is an excellent glue for use on paper.

Portable or Mouth Glue.—Fine pale glue 1 lb., dissolve over a water bath in sufficient water, add brown sugar ¼ lb., continue the heat till amalgamation is effected; pour on a slab of slate or marble, and when cold cut into squares.

Rice Glue.—The fine Japanese cement is made by mixing rice flour with a sufficient quantity of cold water, then boiling gently, with constant stirring.

Spaulding's Glue.—Soak the glue in cold water, using only glass, earthen or porcelain dishes. Then by gentle heat dissolve the glue in the same water, and pour in a small quantity nitric acid, sufficient to give the glue a sour taste like vinegar, about 1 oz. to every pound of glue.

Tablets, Glue for.—For 50 lb. of the best glue (dry) take 9 lb. glycerine. Soak the glue for ten minutes and heat to solution and add the glycerine. If too thick, add water. Color with aniline.

Tungstic Glue.—Tungstic glue has been suggested as a substitute for hard India rubber, as it can be used for all the purposes to which this latter is applied. It is thus prepared: Mix a thick solution of glue with tungstate of soda and hydrochloric acid. A compound of tungstic acid and glue is precipitated, which, at a temperature of 86 to 104 F., is sufficiently elastic to be drawn out into very thin sheets.

Veneering, Glue, Well Suited for Inlaying.—The best glue is readily known by its transparency, and being of a rather light brown, free from clouds and streaks. Dissolve this in water, and to every pint add a ½ gill of the best vinegar and ½ oz. of isinglass.

Waterproof Glue.—1. Glue may be rendered insoluble by tannic acid dissolved in a small quantity of soft water.

2. In order to render glue insoluble in water, even hot water, it is only necessary when dissolving the glue for use to add a little potassium bichromate to the water and to expose the glued part to light. The proportion of potassium bichromate will vary with circumstances; but for most purposes about one-fiftieth of the amount of glue used will suffice. In other words, glue containing potassium bichromate, when exposed to the light, becomes insoluble.

3. To make an impermeable glue, soak ordinary glue in water until it softens, and remove it before it has lost its primitive form. After this, dissolve it in linseed oil over a slow fire until it is brought to the consistence of a jelly. This glue may be used for joining any kinds of material. In addition to strength and hardness, it has the advantage of resisting the action of water.—*Revue Industrielle.*

4. Fire and Waterproof Glue.—Mix a handful of quicklime with 4 oz. of linseed oil; thoroughly lixiviate the mixture. Boil until quite thick, and spread on tin plates. It will become very hard, but can be dissolved over a fire like common glue.

5. Cheap Waterproof Glue.—Melt common glue with the smallest quantity of water possible. Add to this by degrees, linseed oil, rendered drying by boiling it with litharge. While the oil is added the ingredients must be well stirred, so as to mix them thoroughly.

White Glue.—A writer in the *Moniteur Scientifique* says that to add oxalic acid and white oxide of zinc in the proportion of 1¼ to glue gives a whiter and clearer product than any of the measures now in use. The glue should first be reduced with water and heated to a thick sirup, and the chemicals added while the mass is hot.

Wood, Glue for (Waterproof).—1. Very thick solution of glue, 100 parts; linseed oil varnish, 50 parts; and 10 parts of litharge. Boil for ten minutes and use while hot.

2. There is no glue for wood which must be kept in contact with water that is better than

bichromated glue. Allow it to harden thoroughly.

3. Liquid glue for wood and iron is made, according to Hesz, as follows: Clear gelatine, 100 parts; cabinetmaker's glue, 100 parts; alcohol, 25 parts; alum, 2 parts; the whole mixed with 200 parts of 20% acetic acid and heated in a water bath for six hours.

4. An ordinary glue for wood and iron is made by boiling together for several hours 100 parts glue, 260 parts water and 16 parts nitric acid.

5. Waterproof glue may be made by boiling 1 lb. of common glue in 2 qt. of skimmed milk. This withstands the action of the weather.

6. Glue, 12 parts; water, q. s. to dissolve. Add yellow resin, 3 parts; and, when melted, turpentine, 4 parts. Mix thoroughly together in a water bath.

7. Glue which Stands Moisture Without Softening.—Dissolve in 8 fl. oz. of strong methylated spirit, ½ oz. each of sandarac and mastic; next add ½ oz. of turpentine. This solution is then added to a hot, thick solution of glue, to which isinglass has been added, and is next filtered while hot through cloth or a sieve.

Wounds, Glue Dressing for.—Cabinetmakers and wood workers generally are familiar with the uses of glue in dressing tool cuts and other slight wounds incident to their calling. The addition of acetic acid to the glue and a little otto of roses will cover the odor of the glue and the acid. This compound *spread* on paper or muslin makes, he says, a good substitute for adhesive plaster for surgical use. It is easily and quickly prepared simply by putting into a vessel of boiling water a bottle containing 1 part of glue to 4 parts by measure of the acid, and letting the bottle remain in this bath until the glue is fully dissolved and mixed with the acid. Common glue may be used and officinal acetic acid, to be had at any drug store. The mixture should be kept in a wide mouthed bottle well stoppered by a long cork, which can always be removed by heating the neck of the bottle. Care should be taken to keep the mouth of the bottle clean by wiping it well with a cloth dipped in hot water. A bottle of this cheap and easily prepared dressing would be a good thing to have at home as well as at the workshop.

Glycerine of Cucumber.

White castile soap	½ oz.
Pommade de concombre	1 oz.
Rose water	30 fl. oz.
Glycerine	2 fl. oz.

Cut up the soap small and dissolve it in about 4 oz. of the water. Melt the pomade and put it in a hot mortar. Gradually add the hot soap solution, stirring until thoroughly mixed, then slowly add the rest of the rose water mixed with the glycerine. Keep well stirred until cool, then let stand for some hours, stirring occasionally. Properly manipulated, a perfect emulsion is obtained. When completed it may be perfumed as desired. The soap employed should be of good quality.—*Drug. and Chem.*

Glycerine.—*Paste.* See *Pastes.*

Solvent Powers of Glycerine.—According to Klever, 100 parts glycerine will dissolve—

	Parts.
Acid arsenious	20·00
Acid arsenic	20·00
Acid benzoic	10 to 20·00
Acid boracic	10·00
Acid oxalic	15·00
Acid tannic	50·00
Alum	40·00
Ammonia carbonate	20·00
Ammonia muriate	20·00
Antimony tartrate	5·50
Atropine	3·00
Atropine sulphate	33·00
Barium chloride	10·00
Borax	60·00
Brucine	2·25
Cinchona	0·50
Cinchona sulphate	6·70
Copper acetate	10·00
Copper sulphate	30·00
Iron lactate	16·00
Iron sulphate	25·00
Iodine	1·90
Lead acetate	20·00
Mercury bichloride	7·50
Mercury bicyanide	27·00
Mercury arseniate	50·00
Potash chlorate	3·50
Potash and iron tartrate	8·00
Potassium bromide	25·00
Potassium cyanide	32·00
Potassium iodide	40·00
Morphine	0·45
Morphine acetate	20·00
Morphine muriate	20·00
Soda arseniate	50·00
Soda bicarbonate	8·00
Soda carbonate	98·00
Phosphorus	0·20
Sulphur	0·10
Strychnine	4·00
Strychnine nitrate	0·25
Strychnine sulphate	22·40
Veratrine	1·00
Zinc chloride	50·00
Zinc iodide	40·00
Zinc sulphate	35·00

Glycerine is particularly valuable as a solvent for gum arabic, as also in paste. Glue, by continued digestion, is soluble in glycerine, gelatinizing on cooling.

Glycerine, to Test.—Pure glycerine may be tested as follows: When treated slowly with sulphuric acid it should not turn brown, with nitric acid and nitrate of silver it should not become cloudy, and when rubbed between the fingers it does not emit a fatty smell.

Gnats, to Prevent the Attack of.—The best preventive against gnats, as well as the best cure for their stings, is camphor.

Goatskin, to Clean. See **Cleansing.**

Gold. See **Alloys.**

Gold. See **Gilding.**

Gold, to Clean. See **Cleansing.**

Gold Colors:

Yellow gold,	gold, 24 parts.	
Red gold,	gold, 18 parts,	copper, 6 parts.
Green gold,	gold, 18 parts,	silver, 6 parts.
Blue gold,	gold, 18 parts,	iron, 6 parts.
White gold,	gold, 12 parts,	silver, 12 parts.

Gold Lace, to Remove Mildew from. See **Cleansing.** *Mildew.*

Gold and Silver, Printing in.—1. Roll the type with gold size or best pale printer's varnish; dust on the impression the required color, in powder, let dry, and brush off superfluous powder with a ball of cotton wool, a hare's foot, or a soft brush.

2. If a deep rich gold is wanted use a yellow or orange ink instead of varnish, and similarly for very fine work in color, grind up the required color in varnish, print with that, and then dust on some of the same powder. You can get almost any shade of metallic powder in crimson, green, silver, or deep or light gold.

Gold, to Test the Purity of.—An assay or analysis is the only good method. Gold should dissolve in a mixture of 1 part nitric with three parts hydrochloric acid. A residue indicates silver. If sulphuric acid is added to the solution, a precipitate indicates lead. One quick method is to determine its specific gravity. Silver may be dissolved in nitric acid. It should, with excess of ammonia, give a colorless, clear solution. Sulphuric acid may be used to test for lead.

Gold, Solution of.—Put 40 dwt. of aqua regia in a small bottle, to which add 5 dwt. of

grain gold, the solution will immediately commence, and may be observed by the effervescence which arises at the time; when the solution is complete, the whole of the gold will be dissolved, which will be accomplished in about two hours if the acids be genuine, but when they are not, it will be requisite to apply heat to assist in facilitating the solution.

Gold Solder. See **Soldering.**

Gold, Toughening of.—The most effectual process yet discovered to toughen brittle gold is by simply passing chlorine through the molten metal. By this method a saving of one half in the amount of gold usually set aside as unfit for working has been effected.

Goulard's Water. See **Waters.**

Government Whitewash. See **Whitewashes.**

Grafting Compost.—Clay tempered with water, to which a little linseed oil is sometimes added. Used to cover the joint formed by the scion and stock in grafting.

Grafting Wax. See **Waxes.**

Graining.—This branch of the painter's art consists in imitating the grain, knots, etc., of different woods. The following is an outline of the process: If there are any knots or sappy places in the article, they should be covered with one or two coats of glue size or parchment size, to prevent them showing through. The work is then ready for the paint, three different shades being necessary. These are called the ground color, the stippling color, and the graining or oil color, and they are laid in the order named. An infinite number of combinations of colors is possible, obtained by the use of various coloring pigments in the different coats, and no two grainers agree as to the precise proportion of the ingredients to be used in imitating different woods; the learner can vary the proportions to suit his taste, as experience dictates, and to suit the work in hand. The ground color is used to represent the lightest part of the grain of the wood, the stippling color the intermediate shades, and the graining color the darkest parts; a close study of natural woods will, therefore, be neccssary to determine the color and depth of each. The proper ground being selected, apply one or more coats—as many as are necessary to thoroughly cover the surface. As soon as the ground color is hard the stippling coat may be applied. This is prepared by mixing the dry pigments without oil, with either very thin gum water, stale beer, or vinegar containing a small portion of dissolved fish glue. The pigments to be used are usually about the same as those used for the ground color, but of different proportions, to produce a deeper shade. Apply the stippling color and before it dries beat it softly with the side of the stippler, the long elastic hairs of which, disturbing the surface of the laid coat, cause the lighter coat beneath to become indistinctly visible, and produce the effect of the pores of wood. Next apply the graining color; as soon as it is laid; take the rubber, and with it wipe out the larger veins to be shown, after each stroke wiping the paint from the rubber with a cloth, held in the other hand for that purpose. Some grainers use a small sponge for veining, and others a small piece of cloth over the thumb, but the rubber is probably the most convenient. When the veins have been put in, to imitate as closely as possible the markings of natural wood, the various steel combs are brought into use, and the edges of the veins, and sometimes other portions of the work, combed with them to soften the abrupt transition from the dark to lighter shades. The blender is also now brought into use, and wherever the work may require it, the colors are still more softened and blended by its soft hairs. When too much color has been removed in veining, or when a certain figure, such as a knot, is required, the work is touched up with a fine brush and again softened with the blender. When dry, a coat of transparent varnish should be applied, having considerable oil to render it durable, as grained work is frequently washed. Ready made graining colors are recommended as best and cheapest.

Colors.—In ground colors the essential condition is to have them light enough; the same tint will do for ash, chestnut, maple, light oak and satinwood, but a deeper tone is needed for black walnut. The most important point is to have the ground smooth and uniform. Graining colors should be chosen from the very best qualities of umber, sienna and Vandyke brown, according to the demands of the work.

Tools.—The implements employed by the grainer comprise, in addition to the ordinary painters' tools (a dusting brush and 2 or 3 flat fitches) for applying the graining colors to the groundwork, a badger hair blending brush or softener, a set of combs, overgraining brushes suited for maple and oak, and a camel's hair cutting brush for maple. You may add a large cotton rag, a sponge, a lining tool, a veining horn, and combing and graining rollers. The combs may be of steel or leather. A set of steel combs contains three of each size—1-in. wide, 2-in., 3-in. and 4-in., of fine, medium and coarse teeth. A cloth put round a steel comb is often substituted for a leather comb.

Styles of Graining.—The various styles of graining differ according to the kind of wood which it is intended to imitate. These may be considered in alphabetic order, premising that as oak is the wood most commonly copied, the fullest details will be found under that head.

Ash.—Ash graining differs from light oak almost solely in the absence of the dapples found in the commoner wood. The ground color is prepared in the same way, and the same system of combing and wiping is followed. Excellent ash graining color can generally be purchased to greater advantage than it can be made up.

Chestnut.—It is difficult to get the ground color for chestnut sufficiently yellow; the best composition is white lead, yellow ocher and orange chrome. The graining color is composed of burnt umber with small quantities of burnt sienna and Vandyke brown. The operations followed resemble those with oak, a coarse comb being used.

Mahogany. — This wood demands a bright ground color, which may be obtained by using deep orange chrome yellow and royal red, or vermilion, or orange mineral. Burnt sienna with a little Vandyke brown constitute the graining color. The style of grain varies. Generally in panels crotching is resorted to. The cutter is used to take out the lights; and the fine lines are put in with the over grainer, used almost in its normal condition, without being broken up into teeth, the lines running in a wavy pattern across the panel, like an inverted letter V. On the stiles and rails of the door, the blender is drawn over the fresh graining color in a series of jerky strokes 3 or 4 in. long. When the first distemper color is dry, a very thin coat of quick rubbing varnish is put on; this should be dry in a day or so, when a glazing color of the same composition as the original graining coat is rubbed in, and stippled with the blender. A finishing coat of hard drying coach body varnish is flowed on with a thick badger brush.

Maple.—This is imitated in water colors or distemper on a very smooth ground, using a white containing the smallest possible additon of raw sienna for the ground color, and raw sienna mixed with a little Vandyke brown and burnt sienna for the graining color. Fine sandpaper is employed for smoothing the ground, and the graining color is applied in very small quantity to a patch at a time. The best way of taking out the lights is by means of the cutter already mentioned, drawn lengthwise over the work; blending follows in a crosswise direction. The overgrain color is applied by a piped tool in

which the pencils are separated, this being drawn longitudinally in an undulating manner. Putting in the birds' eyes may be done by patting the wet work with the finger tips, or by a piece of cloth rolled into a point.

Oak, light.—The best ground color is white lead tinted with raw sienna or golden ocher. This is preserved in a covered vessel, and sufficient only taken out to cover the area immediately wanted. This need be but a very small quantity; it is thinned before use by adding oil and turpentine and just enough boiled oil to delay the drying, so that the glazing coat can be applied on the following day. To hasten the drying, a little japan size or drier is added. Instead of completing small sections of work, it is better to prepare a large surface with ground color, so that it may commence to set before wiping out. This wiping out must precede the combing on veins and sap wood, but follow it on dapples.

The complete mode of precedure for light oak graining a panel door is as follows: Apply the ground color; when dry, smooth the surface with fine sandpaper. Rub in the graining color uniformly with a medium stiff sash brush; and stipple the beads, corners and mouldings with a dry brush. Commence on the panels, and make opposite ones correspond; wipe out in streaks lengthwise with a cotton cloth, and then go over with combs of progressive fineness. Take out the lights to show the dapples, either by the veining horn or by a cotton cloth wrapped around the thumb. Next comb the mouldings plainly. The most work is usually put on the rails and stiles; begin with the middle stiles, and finish them before proceeding to the rails, which may be done all together. On the sap wood or veined work, use the coarse comb as much as possible, and the wiping rag as little, remembering that here the wiping out precedes the combing. Allow the work to dry, rub down slightly with fine worn sandpaper, and apply the glazing coat. This is best ground up in water, the colors being a combination of raw and burnt sienna and Vandyke brown, mixed very thin, and used in very small quantity.

The tone may be varied to correct the appearance of the under coat; and as some parts of the work will require it thinner than others, it is well to have the color on a palette, and thin it to requirements by wetting the brush. Rub in the glazing color with a stiff brush, and remove any streaks by softening with a blender. Deal with only one panel at a time, or the glazing will dry ahead of you. Put in the top grain with an overgrainer dipped into thin color and then parted into a series of pencils by passing the comb through it; draw it lengthwise with a light hand, and soften down the result with a blender. Remember that the panels should be the lightest colored portion of the door, and the mouldings the darkest, while the rails and stiles occupy an intermediate place in this respect.

To grain light work in distemper, which is not often done, proceed as follows: Lay on a coat of size and whiting; then a ground color consisting of white lead and golden ocher, mixed with fine boiled oil; when this has dried (say in two days), add the graining color, consisting of raw and burnt sienna and Vandyke brown, ground in water and mixed with the same quantity of smooth, flour paste; thin this down with water, brush it on and comb one portion and have the other stippled by the whitewash brush to afford contrast; when all is dry, apply a heavy flowing coat of elastic varnish.

Oak, Dark.—This differs from light oak graining only in the colors. The ground color may be composed of white lead, royal red and golden ocher or chrome orange. The graining color has the same constituents as for light oak, only in other proportions.

Rosewood.—For rosewood graining, the ground is rubbed in with crimson vermilion, then smoothed and glazed with a coat of crimson lake or rose pink before putting in the grain. This is done with best ivory black, which can be bought ground in quick-drying vehicles and needs letting down with raw linseed oil. The graining coat is blended with the badger hair pencil as fast as it is laid on. When quite dry, a very thin glazing coat of black is added.

Satinwood.—This is grained in distemper, using the same ground and graining colors as for bird's eye maple, taking out the lights with a cutter and putting on the overgrain as in mahogany.

Walnut.—The ground color may consist of white lead, golden ocher, black and royal red, without fear of making it too bright. The graining color should be preceded by a coat of deep black and Vandyke brown ground in water; and before it has set this is stippled by dabbing with a dry bristle brush. On this is laid the walnut oil graining color, procurable at the shops, previously thinned with turpentine and boiled oil. When the graining coat has partially set, the veins and figures are put in preferably with a fine hair pencil, and softened with the blender. This last having dried, say in a day or two, a glazing coat of deep black and Vandyke brown is put on and finished as in light oak.

Hints.—To prevent a graining coat from "cissing" at a water color overgraining coat, that is repelling the water by antagonism of the oil, rub the grain with a sponge dipped into a thin paste of fuller's earth or whiting, which will prepare an absorbent surface for the water color.

The two kinds of graining, distinguished as distemper graining and oil graining, differ in the following respects. In distemper graining, the older branch of the art, the colors are thinned with stale beer, size, etc., and the varnishing coat can be added quickly; it is best adapted to hard closegrained woods. In oil graining, the colors are thinned with raw or boiled linseed oil, turpentine, etc., and are better suited to the soft, coarse grained woods.

Marbling.—The decoration of painted surfaces so as to imitate natural marbles bears a close relation to graining in imitation of woods. It varies according to the figure of the marble simulated, the principal kinds being as follows:

Black and Gold.—The ground color is black, laid on very smooth, and slightly oiled; the marble color will be composed of white, ocher, orange chrome, Indian red, and black, in varying proportions. The marble color is rubbed in in disconnected irregular patches by a large pencil, fine irregular lines being added, both connecting the patches and crossing the general direction. An overgraining of dark and light lead color may occupy the spaces between the fine lines and a glazing of white touches will help to develop the patches.

Black Bardilla.—Use light lead color as a ground, and put in a confused mass of fine lines in black by the aid of a feather; soften with a badger blender, and when dry glaze with thin white of unequal strength.

Derbyshire Spar.—Use light gray for a ground color, and glaze it with a thin mixture of black and Vandyke brown, with a little Indian red at intervals. To simulate the fossils use a stick with a piece of rag round it, then glaze with the same colors, and bring out the fossils by solid white and edging with fine black.

Dove.—The ground color is a bluish red. Put in streaks of black and white (ground in oil) alternately by dipping a feather into turpentine and then into the color; soften with a blender, add a few white touches, and soften again.

Egyptian Green.—The ground color is black. Glaze over this with a very dark green from Prussian blue and chrome yellow with a sash

tool; on this streak with a lighter green on a feather, with a little Indian red interspersed, all in one direction; cross this with curling streaks of thin white, blend well, allow to dry, glaze with Italian pink and Antwerp blue, bring up the light streaks with touches of white, and finally blend again.

Granites.—The chief varieties are gray and red (Aberdeen). Rub in the ground color of light gray for the former, or salmon tint for the latter. The marbling colors will be thin black for the former and black, red and white for the latter. These colors are put on in dots and splashes, either by stippling with a coarse sponge dipped in the color, or by springing the color from a short, stiff, broad brush.

Italian Jasper.—Oil a ground of light green drab; rub in subcircular patches of a mixture of Victoria lake and Indian red; between these put in, with a feather dipped in turpentine, successive tints of olive green (white, raw sienna and blue black) and gray (white, Prussian blue and ivory black), blending well. The olive and gray tints are glazed with white, and the dark with crimson lake; and a final touching up is given with very thin white on a feather.

Royal Red.—On an oiled ground of bluish gray, rub in a mixture of ocher and Indian red. Cover part of the work with a rich brown made from ivory black and Indian red, and scatter patches of black about by a paper pad dipped into the color. Repeat the patching with light blue and with white; then wipe out a few irregular lines so as to show up the gray ground color. Finally, glaze partially with black and Indian red.

St. Ann's.—Resembles black and gold, the ground being black, the veins white and the spaces lead color; the colored patches are less in size and more numerous.

Sienna.—The ground color is buff, made with ocher. The various marbling tints are made from the following ingredients: A mixture of Indian red and ivory black for dark veins, with a few varying shades by the addition of white; a selection of graduated tints from white, Indian red and Prussian blue. The glaze is made from raw sienna and ocher, with a trace of crimson lake at intervals. First put in the buff ground, and on this a pronounced irregular vein across the work of the first marbling color, applied on a feather dipped in turpentine; lead a few veinlets from the main vein, and put in others with the second marbling color, also on a turpentined feather; soften with a badger blender; on the dry surface rub a little linseed oil with a silk rag; touch up with thin white on a feather; soften as before; add the glaze color and touch up the main vein with ivory black on a pencil.

Verd Antique.—Cover an oiled black ground with dark green made from chrome yellow and Prussian blue; add with a feather patches of lighter green, with occasionally a little Indian red, interspersed with irregular blotches of black and white; on the dry surface put a green glazing coat of Italian pink and Antwerp green; again touch up the whites, and give them a fine black margin.

Granite, Gilding on. See **Gilding.**

Granulation.—1. In metals the metal is fused and poured into cold water, when the metal becomes finely divided, taking on a spherical shape. Shot is made in this way.

2. In pharmacy, etc., the process is called granulation when the liquid to be converted wholly into a solid is concentrated until it is of a sirupy consistency, then removed from the fire, and stirred until the mass is cooled into granules. Sugar is a good example of the process.

Grape Wines. See *Wines.*

Grass, to Crystallize.—Dry the leaves, steep in a strong solution of alum for a few minutes, and dry again.

Grass, to Kill.—To kill blue grass growing between bricks around the lawn, wash the bricks with salt water or strong solution of soda.

Gravity, Specific.—To Convert Degrees Baumé into Specific Gravity.—1. For liquids heavier than water.—Subtract the degree of Baumé from 145, and divide into 145. The quotient is the specific gravity.

2. For liquids lighter than water.—Add the degree of Baumé to 130, and divide it into 140. The quotient is the specific gravity.

To Convert Specific Gravity into Degrees (Baumé).—1. For liquids heavier than water.—Divide the specific gravity into 145, and subtract from 145. The remainder is the degree of Baumé.

2. For liquids lighter than water.—Divide the specific gravity into 140, and subtract 130 from the quotient. The remainder will be the degree of Baumé.

Comparison of Degrees Twaddell and Specific Gravity.—In order to change degrees Twaddell into specific gravity, multiply by 5, add 1,000, and divide by 1,000.

Example.—Change 168° Twaddell into specific gravity.

$$168 \times 5$$

$$840$$

$$1{,}000$$

$$1{,}000\overline{)1{,}840}$$

1·84, specific gravity.

To change specific gravity into degrees Twaddell, multiply by 1,000, subtract 1,000, and divide by 5.

Example.—Change 1·84 specific gravity to degrees Twaddell.

$$1{\cdot}84 \times 1{,}000$$

$$1{,}840$$

$$1\,000$$

$$5\overline{)840}$$

168° Tw.

Graying of Iron and Steel.—By dipping or sprinkling with dilute nitric acid after heating until blue.

Grease, Anti-friction. See **Lubricants.**

Grease, to Remove. See **Cleansing.**

Greenhouses, Floor and Pipes of.—Cover your floor with a thin layer of hydraulic lime or cement. Paint your pipes with a covering of asphaltum varnish, made by dissolving asphaltum in turpentine by a gentle heat.

Green Pigments. See **Pigments.**

Greek Fire.—The exact composition is unknown. It is supposed by some to have been naphtha, by others a mixture of niter, asphalt and sulphur.

Grindstones, Artificial.—Artificial grindstones have been made at Worms, Germany, of grit, soluble glass, and petroleum. It is said that they will bear a very high speed without becoming soft. Washed silicious sand, 3 parts; shellac, 1 part; melt the lac and mould in the sand while warm. Emery may be substituted for sand. Used for razors and fine cutlery.

Grindstones, to Hang.—It requires a pretty fair mechanic to hang a grindstone to run true and stay true. It is supposed that you have no flanges upon the axle. The hole should be at least ⅛ or 1/16 in. larger than the axle, and both axle and hole square; then make double wedges for each of the four sides of the square, all alike and thin enough, so that one wedge from each side will reach clear through the hole. Drive the wedges from each side. If the

hole through the stone is true the wedges will tighten the stone true; if the hole is not at right angles to the plane of the stone it must be made so, or the wedge corresponding must be altered in the taper to meet the irregularity in the hole.

Grindstones, to True.—Drive at a moderate speed and true up with a rod of ½ in. or ⅜ in. iron, or better, a piece of tube. To use it, keep turning the rod or tube, which should be held nearly at right angles, and turns as the edge grinds away. By thus turning it round a new edge is formed all the time that the stone is turned off true. The stone should be dry, not wet. Do not attempt to perform such an operation close to a lathe or other machine without thoroughly covering them up, as the dust flies everywhere and will cause serious damage.

Grinding and Polishing, etc., Speeds for.—

Speed of	Ft. per min.
Large grindstones for polishing	2,000
Emery disks	2,500 to 3000
Polishing large articles	750
Tool grinders	650
Circular saws for hot iron	20,000
Disintegrators	10,000
Plate-bending rolls	4
Millstones	17,000
Sack tackle	50

Grounds for Etchings. See **Etching.**

Ground Glass. See **Glass.**

Ground Glass, Varnish for. See **Varnishes.**

Grout.—Mortar reduced to a thin paste with water, used to fill up the joints of masonry and brick work A finer kind is used to finish off the best ceilings.

Guaiacum.—A resinous exudation of a tree of Jamaica, 90% soluble in absolute alcohol.

Guano, Artificial.—Dry sulphate of soda (Glauber salts), 5½ lb.; wood ashes, 14 lb.; common salt, 42 lb.; crude sulphate of ammonia, 56 lb.; bone dust, 3½ bushels.

Gum, Chewing.—Take of balsam tolu 4 oz., white resin 16 oz., sheep suet 1½ oz., more or less, and melt together. Of above mixture take 2 oz.; white sugar, 1 oz.; oatmeal 3 oz. Soften and mix on a water bath. Roll the pieces in finely powdered sugar or flour to form sticks, etc., as desired. Paraffin with a little olive oil and glycerine may be melted together for a chewing gum. The exact mixture will vary with the season, etc.

Gum Paste. See **Pastes.**

Starch, Gum.—Dissolve 4 oz. of the purest gum arabic in 1 qt. hot water, set away in a bottle, tightly corked. A splendid preparation for starching silks.

Gums. See also **Resins** and **Balsams.**—The distinctions between gums, resins and balsams may be briefly tabulated as follows:

Resins are the inspissated or thickened juices of plants. They are generally mixed with an essential oil, are insoluble in water, but are soluble enough in either alcohol or the essential oils. Their general characters are inflammability and fusibility. Their ultimate components are carbon, oxygen and hydrogen.

Gums are soluble in water, but are insoluble in alcohol.

Balsams or gum resins contain a quantity of gum, are partly soluble in water, partly so in alcohol, or in other words, they take both alcohol and water to perfectly dissolve them.

Gum arabic is yielded by several species of acacia. It is quite soluble in water, but insoluble in alcohol, ether and oils. It forms an acid solution, as permalate of lime is present. Several of the metallic oxides combine with it. It is very nutritious, so much so that the Arabs who gather it nearly live upon it during harvest time. We import it from the Levant, Barbary, Senegal, Cape of Good Hope, India, Cairo, etc.

Gum Bassora.—Gum is almost insoluble in water. Comes from Bassora. *Gum Turkey*, variety of gum arabic.

Gum senegal, the product of acacia senegal. This is the best kind of Arabian gum. It is much more clear than gum arabic, sometimes entirely white, in drops as large as a pigeon's egg. Its principal use is in the manufacture of silks, muslins, crapes, etc., to give them the requisite amount of stiffness and glaze. It is also mixed with the colors in calico printing to give them solidity.

Gum tragacanth or gum dragon. This is obtained from *Astralagus tragacantha*. In appearance it resembles twisted ribbons, of a brownish white color, opaque and rather ductile. When pulverized in a mortar it is of a white color. The operation of pulverizing is a difficult one, and should be performed in a hot mortar, the gum having been previously heated to 212° F. This gum has a remarkable power of consistence, a small piece swelling up to many times its own size. It has not, however, such a strong power of adhesiveness as gum arabic, but if equal parts of the two be mixed together it forms a nice white gum, very suitable for fastening plants to paper, and other natural history work. The tree is itself a native of Crete.

Gum Sandarac.—The product of *Callitris quadrivalvis* is a native of Barbary. This gum is chiefly used in the manufacture of varnishes, for which it is peculiarly adapted. The Turks employ the wood in the construction of their mosques, it being very tough and possessing great lasting qualities. Importation about fifteen tons per anuum.

Gum Seed.—A soluble gum obtained from the quince, flax, etc.

Barbary Gum.—A very dark looking kind produced by the *Acacia gummifera*. In the manufacture of lozenges and confectionery it has valuable qualities. It calls for no special comment. We import it from the Morocco coast.

Gum Gedda.—An inferior quality of the foregoing. Reddish color.

Canada Balsam.—This is supplied by the *Abies balsamifera*. It is contained in blisters in the bark. The blisters are punctured, and the balsam is collected as it exudes. This is a most useful substance, being in great demand in a number of manufactures, etc. It is used in cementing lenses together. In microscopy comment is needless, but besides being an excellent preservative, it gives great transparency to the object.

Cherry Tree Gum.—Partially soluble in water.

Guaiacum.—This resin exudes from the *Guaiacum officinale*, a native of Jamaica and the surrounding islands. A piece of paper treated with a tincture of guaiacum takes on a green tint under the violet rays, when exposed to the prismatic spectrum, through oxidation. Red rays destroy the color. Solubility, 90% in absolute alcohol. Lignum vitæ, the hardest and heaviest wood known, and which sinks on being placed in water, is the timber of this tree.

Copal.—This is the product of several leguminous plants in Africa, East Indies, South America, and Australia. It is generally seen in large angular lumps, often as large as a hen's egg, of a bright yellow color, and very transparent. The African variety is of a darker color, and not so transparent; its surface appears dusty. The Australian is the largest. That from the East Indies is the product of Hymenæa courbaril. In lumps sometimes nearly square and generally covered all over with slight indentations. It is known as gum anime. Chiefly used for fine varnishes.

Gum Mastic.—The product of *Pistacia lentiscus*. In small ovoid and round tears about the

size of a pea and rather flattened. The tree is a native of Chio and Northern Africa. To obtain the resin the bark is cut transversely, after which the mastic exudes in small drops and either hardens on the bark or falls to the ground; that which falls to the ground is the inferior quality. It has a fragrant smell, and is much used by the Turkish ladies in their toilet. A fine varnish is made from it. Dentists also use it for stopping hollow teeth. About ten or twelve tons are imported annually, mostly from the Levant.

Gum Dammar.—This is a light colored substance which is obtained from the *Pinus dammara*, native in India, from whence it is exported. It is very useful in making varnishes, especially photographic. It is soluble in benzole, only partly so in alcohol, and is used sometimes as a substitute for Canada balsam.

Gum Gamboge.—A product of *Hedradendron gambogioides*, native on the Malabar coast and in Ceylon. It is a gum resin, and is obtained by puncturing the bark of the tree when the flowers begin to appear. We know it best by its appearance in amorphous masses, but it also takes the form of hollow rolls and solid cylinders. The best hollow rolls come from Siam. From this gum the beautiful yellow color of gamboge is manufactured.

Gutta Percha.—The inspissated juice of *Isonandra gutta.*—When freshly gathered it is rough, dry, slightly soluble and very inflammable. To render it fit for use it is immersed in boiling water; this softens it and makes it capable of being moulded into any shape, which it retains when cold.

The juice is found between the bark and the wood. Its uses are too numerous to specify, many being well known.

Caoutchouc.—India rubber is the product of many euphorbiaceous plants. We get most of it from the Brazils and Central America. In Brazil it is obtained from the *Siphonia elastica*, which grows to a height of between fifty to sixty feet, and in Central America it is obtained from *Castilloa elastica*. Most of that we now use comes from Central America, where the juice is simply collected into cups, from incisions made in the bark. To coagulate the milky juice and convert it into rubber fit for exportation, the juice of a vine called achuca is mixed with it, and so powerful is its action that five or six minutes is sufficient to produce coagulation. The Brazilian method slightly differs. The juice is first collected in clay bowls, it is then smeared over various shaped moulds, made also in clay and taking the form of bottles, balls, spindles, etc. Successive coats are laid on, each one having previously been allowed to thoroughly dry, either in the sun or the smoke of a fire, which blackens it. When a sufficient thickness is obtained, the clay is washed out, leaving the India rubber ready for exportation. The trees yield twenty or thirty gallons of juice, and when we consider that each gallon will produce two pounds of market India rubber, the harvest is not so bad. Other trees producing caoutchouc are *Siphonia brasiliensis, S. lutea. and S. brevifolia.*

Dextrine, British gum, torrified starch.—To produce this gum, starch is heated until vapor rises; by this procedure the starch becomes soluble both in cold and hot water, and all its gelatinous character disappears. It can also be made by moistening 1,000 parts of dry starch with very dilute nitric acid. It is formed in small blocks and dried in the open air, afterward being placed in an oven heated to 152°. After this they are pulverized and again dried by heat. In color dextrine is pale yellow, insoluble in alcohol, more flexible and not so brittle when dry as gum. Dextrine and starch have the same chemical composition, $C_6H_{10}O_5$. The gum on the back of postage stamps is dextrine.

Gum Thus or frankincense, an odoriferous product of the *Boswellia serrata.*—It is of slight use except for its odor, which the Roman Catholics turn to account in their churches. Employed also by the ancient priests of Egypt, its odor destroying the foul emanations from the sacrifices. It is imported from India and sometimes the Levant.

Asafœtida (Narthex asafœtida).—This flows from incisions made in the root of the tree. In color it is milky white, but after it has been dried it takes on a pinkish tint and is curiously mottled. It has a most unpleasant odor. Afghanistan and Persia is the home of the tree. It is used medicinally as an anti-spasmodic in cases of asthma.—*Science Gossip.*

Anime.—A pale brownish yellow, transparent, brittle resin, which exudes from the *Hymenæa courbaril* (Linn.), or locust tree, the *H. martiana*, and other species of Hymenæa growing in tropical America. It contains about 2% of volatile oil, which gives it an agreeable odor, melts without decomposition, is (nearly) insoluble in alcohol and caoutchoucine, but forms a gelatinous mass in a mixture of the two.

Gum, Yellow.—(Botany Bay resin). This substance is produced by an Australian tree named *Xanthorrhœa hastilis.* It is not a gum, but a gum resin, being insoluble in water, but soluble in alcohol. It is found in reddish brown irregular masses, partially semi-transparent and lustrous, and in parts dull and earthy, often bearing impressions of the bark of the tree. It is used in making varnishes.

Gum Peru.—The root of a plant of the asphodel tribe, dried, powdered and sifted. It cannot be entirely freed from woody matter, and if used as a thickener it fouls the rollers rapidly.

Kino.—A gum resin obtained from Australia and India, the former kind being yielded by Eucalyptus resinifera and the latter by *Pterocarpus erinaceus.* Kino is red, in small fragments, but appears almost black in large masses. It dissolves both in water and in alcohol with a red color, but the aqueous solution does not remain clear long.

The subjoined table will be found useful in discriminating the various kinds of gums:

Gums.	Sulphate of iron.	Tincture guaiacum.	Subacetate of lead.
Gum arabic.	Yellow precipitate	Blue color.	White curd.
Senegal.	Do.	Do.	Do.
Cherry.	Do.	Do.	Transparent jelly.
Tragacanth.	Do.	No change.	Do.
Dextrine.	No precipitate.		

To Preserve Gum Arabic Solutions.—A few drops of oil of cloves, or of alcohol, or any essential oil, will preserve a quart of the mucilage of gum arabic or gum tragacanth from turning sour. A small quantity of dissolved alum will preserve flour paste.

Artificial or British Gum.—Malt, crushed small, 1 lb.; warm water, 2 gal. Mix, heat the whole to 145° F.; add of potato starch 5 lb.; raise the heat to 160° F., and mash for about twenty-five minutes, or until the liquid becomes thin and clear; it must then be instantly run off, and raised to the boiling point to prevent the formation of sugar; after boiling for three or four minutes, the whole must be filtered and evaporated to dryness by a steam heat.

Gums, Washes for. See **The Teeth.**

Gun Barrels, to Brown. See **Browning Metals.** To **Blue.** See **Bluing.**

Gun Barrels, Varnish for. See **Varnishes.**

Gun Cotton as a Filter.—Gun cotton is used as a filter for solutions of strong acids, alkalies, etc., as it is scarcely acted on by chemical agents, at ordinary temperature.

Gun Cotton.

Gun Cotton.—It may be prepared in small quantities as follows: Mix 4½ oz. of pure dry nitrate of potash with 30 fl. drm. sulphuric acid, specific gravity 1·845, and, after cooling thoroughly, stir into this mixture carefully 120 grn. best carded cotton. As soon as saturation is complete, in about one minute—if proper care has been used—throw the cotton into a tubful of clean rain water, and change the water repeatedly until litmus ceases to show the presence of acid, then squeeze it in a cloth, and after being well pulled out, dry it cautiously at a temperature not exceeding 140° F. *It* is now explosive, and too much caution cannot be observed in handling it.

Gun Metal. See **Alloys.**

Gun Metal, to Blacken. See **Blacking Metals.**

Gunpowder. See **Pyrotechny.**

Gunpowder.—For gunpowder the materials (charcoal, sulphur and saltpeter) are first perfectly dried and separately reduced to impalpable powders. These are then sifted together, moistened with water and ground for some time between large millstones kept constantly moist with water. The wet powder is then collected into large lumps and carefully dried. These lumps are grained by bringing them in contact with sharp teeth fixed upon the periphery of a revolving wheel and agitating in suitable sieves to separate from the finer powder. The powder consists of 76 parts of niter, 13 parts of charcoal, and 11 parts of sulphur.

Gun Sights, Composition for. — Gas black, ½ drm.; methyl alcohol, 2 fl. drm.; spirit varnish, 2 fl. drm.

Gutta Percha.— *Gutta Percha and Caoutchouc, Substitute for* (Sorel).—1. Pitch, 18 parts; calcium hydrate, 9 parts; gutta percha, 24 parts.

2. Coal tar, 18 parts; calcium hydrate, 9 parts; gutta percha, 24 parts. Used for manufacturing waterproof articles, tubes, machine belts, waterproof boots and shoes, etc. If greater tenacity is desired, add cotton, wool or hemp.

Gutta Percha, to Bleach. See **Bleaching.**

Gutta Percha, Cement for. See **Cements.**

Gutta Percha, to Clean. See **Cleansing.**

Gutta Percha Composition. See **Compositions.**

Liquid Gutta Percha.—This useful preparation is to be found in the United States Pharmacopœia, and is made thus: Gutta percha in thin slices, 1 oz.; chloroform, 8 fl. oz.; carbonate of lead, in fine powder, 1 oz. Add the gutta percha to 6 fl. oz. of the chloroform in a stoppered bottle and shake them together frequently until the solution has been effected. Then add the carbonate of lead previously mixed with the remainder of the chloroform, and, having several times shaken the whole together, set the mixture aside and let it remain at rest until the insoluble matter has subsided. Lastly, decant the clear liquid and keep it in a well stoppered bottle. One part of this solution in 10 parts by weight of chloroform produces an excellent and convenient preparation for painting over cuts or wounds. It readily acts as a styptic and protective to the wound and causes neither tension nor pain. If pure iodoform be added, about ten per cent., it further enhances the value of the styptic and can be used in veterinary surgery with marked success for applying to cuts and abrasions, as it arrests hemorrhage, forms a coating over the wound and promotes a healthy cicatrization.

Gutta Percha, to Melt.—The gutta percha may be dissolved by adding bisulphide of carbon; if the liquid thus obtained is poured upon glass, after a short time the gutta percha may be lifted in the form of a thin sheet, the bisulphide evaporating very quickly.

Plastic Gutta Percha.—When gutta percha is steeped for a few hours in benzol or naphtha it becomes considerably swollen; if afterward soaked in hot water, it is exceeding plastic and requires but moderate pressure to obtain most perfect copies from even such fragile objects as plaster of Paris models.

Gutta Percha for Cementing Cloth.—Tailors use a special preparation of gutta percha for this purpose, consisting of a thin tissue, placed between layers of the cloth and pressed with a hot iron. Used extensively to fasten the bottom edge of trousers.

Gutta Percha Varnish. See **Varnishes.**

Hæmorrhoids.—The *Pharm. Era* vouches for this as an excellent salve for hæmorrhoids: Cocaine hydrochloride, 20 gr.; morphine sulphate, 5 gr.; atropine sulphate, 4 gr.; tannin, 20 gr.; vaseline, 1 oz.; rose water, sufficient. Apply after each evacuation of the bowels, contents of which should of course be kept in soluble condition.

Hair, The.—This subject is very difficult to arrange for ready reference. The alphabetical arrangement has been adhered to as far as possible, but some search may be required before the desired receipt is found.

The Hair.—1. This should be washed once or twice a week in tepid or cold water; it should afterward be rubbed dry with a towel. To dry the hair before the fire is injurious to its vitality.

2. Once or twice weekly some one of the washes recommanded for promoting the growth of the hair may be used. Combing and brushing are of great service in promoting the hair's nutrition; soft brushes are the best. Never use a broken, jagged comb, and then go round complaining that your hair is coming out by handfuls.

3. A little—half to one teaspoonful—of scented oil may once a week be rubbed well into the hair and its roots, and the superfluous oil removed by the use of a towel. The daily use of oil, except in some rare cases of obstinate dry hair, is objectionable.

4. If you want a head of thick hair, keep it cut as short as you conveniently can. Never should a woman allow her hair to grow to the level of her waist, for it will thin the hair and weaken the system. Of the moustache, beard and whiskers, it is equally necessary to moderate their length, and that it will be found of advantage to occasionally apply a little oil and some stimulating lotion. Combing and brushing will also be of service. Directly hair shows any signs of thinning, shave it off or cut away as much as possible, according to its situation.

5. Brush the eyebrows every day in their proper artistic line, and occasionally rub in a little olive oil and some preparation. Once every month the tips of the eyelashes may, with advantage, be cut.

Bandoline.—1. Iceland or Irish moss boiled in water, strained and perfumed.

2. Boil in 2 lb. of water until it is reduced one-half, 1 teaspoonful quince seed, 2 tablespoonfuls flaxseed, a pinch white mustard seed. Perfume with oil of almonds.

3. Two tablespoonfuls flaxseed, 3½ pt. water. Boil five minutes.

4. Heat 3 oz. isinglass in 2 lb. water, until dissolved. Add 4 oz. alcohol. Perfume with oil of almonds.

5. Put 2 parts powdered gum tragacanth in 60 parts rose water. Digest for three days. Strain and perfume with essential oil of rose.

These mixtures can be colored with cochineal if desired.

6. Quince seed ..... 2 or 3 drm.
Water ..... 1 pt.

and otherwise proceed as before.

7. Gum arabic (clean, white).....2 oz.
Rose water..... 6 oz.

dissolve and add of—

Tincture of cochineal, or } q. s. to color,
Essence of roses (red)..... }

together with a little spirit, if the product be intended to be kept long in hot weather.

8. Gum arabic ..... 3½ to 4 oz.
Water ..... ½ pt.;

dissolve, etc., as before, and gradually drop
Eau de cologne or lavender water

into the clear strained liquid, until the cloudiness, at first occasioned, ceases to be removed by agitation. The next day decant the clear portion for use.

Bandoline is used by ladies and by hairdressers to stiffen and fix the hair in curl or place. It is applied either by moistening the fingers and passing the hair through them or by means of a small piece of sponge.

9. Rose Bandoline.—Gum tragacanth, 6 oz.; rose water, 1 gal.; otto of roses, ½ oz. Steep the gum in the water for a day or so. As it swells and forms a thick gelatinous mass it must from time to time be well agitated. Squeeze through a coarse linen cloth and allow it to stand for a few days; pass through the cloth a second time, then thoroughly incorporate the otto of roses.

Bay Rum.—1. Bay oil, 1 oz.; oil pimento, ¼ oz.; alcohol, 2 gal.; water, 4 pt.

2. Bay oil, 10 drm.; pimento oil, 1 drm.; acetic ether, 2 oz.; alcohol, 3 gal.; water 2½ gal.; mix, and after two weeks' rest filter.

3. A cheap bay rum can be prepared by saturating a ¼ lb. block of magnesium carbonate with oil of bay; pulverize the magnesia, place it in a filter and pour water through it until the desired quantity is obtained, then add alcohol. The quantity of water and of alcohol depends on the desired strength and quantity of bay rum.

4. Bay rum is made by digesting the leaves of the bay plant, an aromatic plant grown in the West Indies, in rum, and subsequent distillation. An imitation is made as follows: 3½ fluid drm. oil of bay, ½ fluid drm. oil of pimento, 1 fluid oz. acetic ether, 1 gal. alcohol, 3 qt. water. Mix, and after two weeks' repose filter.

Bears' Grease. See **Pomades** and **Hair Oils.**

To Bleach Hair.—Gaseous chlorine and hydrogen peroxide are effectual agents in bleaching hair. The hair should be thoroughly cleaned, with a warm solution of soda, then washed with water. While moist it is put into a jar and chlorine gas introduced, until the air in the jar looks greenish. Allow it to stand for twenty-four hours, and if necessary repeat.

Brilliantine.—Oil bitter almonds, 1 or 2 parts; alcohol, 12 parts; oil, q. s.

Brilliantine, Inseparable.—Oil vicini, 1 part; absolute alcohol, 12 parts; oil and oil of neroli, q. s.

Cosmetiques.—Hard pomatum, either colored or uncolored, under the form of flattened sticks. They are used to color the eyebrows, whiskers, moustache and beard, as well as to keep the hair in its place. The application must be renewed daily, or oftener, as the cosmetique is removed by the friction to which it is incidentally exposed, and perfectly so by soap and water. The habitual and extensive use of colored cosmetiques is dirty and discreditable.

Cosmetique Blanc.—Lard, good hard, 5 parts; white wax, pure, 2 parts. Melt them together.

Cosmetique Brun.—The preceding, colored with any harmless brown pigment, as with levigated umber, raw and burnt, for plain brown, and levigated terra di sienna or Spanish brown for auburn and chestnut. A golden brown, for very light hair, may be given by strongly impregnating the melted fat with annatto, and then adding a little burnt terra di sienna.

Cosmetique Noir.—Hard pomatum (cosmetique blanc) colored with one-fourth or one-fifth of its weight of the best levigated ivory black. The way to insure a perfect mixture of the pigments is to triturate them with a little of the melted fat in a warm marble mortar, before adding them to the rest.

Cosmetique, Transparent.—Transparent cosmetique is nothing more than a transparent soap, made with alcohol. Take a good suet or tallow soap, which is cut into very thin ribbons and exposed to the air and sun until it is thoroughly dried. It is then pulverized in a marble mortar and passed through a fine sieve. The powder thus obtained is directly dissolved in strong boiling alcohol. While the soap is liquid, the colors and perfumes are incorporated with it; 3½ gal. of alcohol of 0·849 sp. gr. are generally used with 50 lb. of soap. A still heated by steam or hot water is used for this operation, as a considerable quantity of alcohol would be lost in a common heating pan, and the direct application of fire would destroy the transparency of the soap.

Curling Fluid.—1. Mucilage of gum arabic, 3 oz.; salts of tartar, 1½ oz.; rose water, 2¼ pt.; orange flower oil (from flowers), 6 oz. Color with liquid carmine.

2. Hair (False) to Preserve the Curl of.—To prevent the curl of false hair coming out by perspiration or weather, use flax seed water.

3. Use the liquid obtained by boiling for ten minutes, 1 drm. quince seeds in ½ pt. water and straining, or steep 6 oz. gum tragacanth for thirty hours in 1 gal. rose water, stirring frequently; strain through a cloth and let stand for a few days; then strain again and work into it 4 drm. oil of rose.

4. Take borax, 2 oz.; gum arabic, 1 drm.; add hot water (not boiling), 1 qt.; stir, and as soon as the ingredients are dissolved add 6 tablespoonfuls of strong spirits of camphor. On retiring wet the hair with the above liquid.

Deficient Hair.—When the hair has been scanty from birth the apparently bald places should be examined by a powerful lens, for the presence of down. The following treatment will probably develop the young hairs which compose the down. Brush the parts with a baby's hair brush for five minutes three times daily. Then gently rub in the following preparation: Tincture of cantharidis, 1 oz.; rectified spirit, 40 oz.; sublimed sulphur, 1 oz.; glycerine, 8 oz. The application should not be wiped off. The part should also be gently bathed with warm water before the application and dried with a soft towel, but not rubbed. When the young hair is seen to be developing the lotion may be changed for the following: Dilute liquid ammonia, ½ oz.; rectified spirit, 10 oz.; sublimed sulphur, ¼ oz.; tincture cantharadis, ½ oz.; glycerine, 2 oz.; phosphate of lime, ¼ oz.; tincture cinchona, ½ oz. This is to be applied in the same manner as the other. Should any irritation of the skin follow, its bulk of glycerine and water, equal parts, may be added.

Depilatories.—Depilatories should be used only with great caution, if used at all. Number 2 is probably the best.

1. Chemical.—Sulphuret of calcium (recent) and quicklime, equal parts. Reduce them separately to fine powder, mix, and keep the mixture in a well stopped bottle. Very effective and as safe as any.

2. A strong solution of sulphuret of barium, made into a paste as wanted with powdered

starch and at once applied. Prof. Redwood says this is the best and safest depilatory.

3. Boudet's Depilatory:

Hydrosulphuret of sodium (crystallized)	3 parts.
Quicklime	10 parts.
Starch	11 parts.

Mix, etc., as No. 1. Very effective. It is ordered not to be applied for longer than two to four minutes.

4. Cazenave's Pommade Epilatoire:

Quicklime	1 part.
Carbonate of soda	2 parts.
Lard	8 parts.

Rub them together so as to form an ointment.

5. Chinese Depilatory:

Sulphuret of potassium	1 part.
Pearlash (dry)	1 part.
Quicklime	8 parts.

Mix. Effective and safe if properly used.

6. Colley's Depilatory:

Niter	1 part.
Sulphur	1 part.
Orpiment	3 parts.
Quicklime	8 parts.
Soap lye (strong)	32 parts.

Boil them together in an iron vessel to the consistence of cream and keep it in a stoppered green glass bottle.

7. Delcroix's Poudre Subtile:

Orpiment	1 oz.
Quicklime	10 oz.
Starch	13 oz.

Mix, etc., as No. 1.

8. Pate Epilatoire: To No. 6 add—

Powdered orris root	3 parts.

Or enough to form it into a paste.

9. Depilatory paste:

Fresh slaked lime	2 parts.
Water	3 parts.

Mix, pass a stream of sulphureted hydrogen into the paste as long as it continues to absorb the gas, and then at once put it into stoppered bottles. It is said to be so powerful that a layer a line in thickness will denude any portion of the scalp or beard in less than three minutes. Its use, therefore, requires the utmost care.

10. Plenck's Pasta Epilatoria:

Orpiment	1 part.
Quicklime	12 parts.
Starch	12 parts.

Mix, etc., as No. 1.

11. Rayer's Depilatory:

Charcoal	1 part.
Quicklime	8 parts.
Salt of tartar (dry)	16 parts.

Mix, etc., as No. 1.

12. Depilatory.—A mixture of quicklime, 8 parts; sulphid of potassium, 1 part; dry pearlash, 1 part; kept in a closed bottle and made with warm water into a paste at the moment of use, is the best depilatory. In order to use it with safety, it must be applied to a small portion of the skin and allowed to remain only five or ten minutes. The safest of all depilatories is a strong solution of sulphide of barium made into a paste with powdered starch and used immediately after being mixed. N. B.—Barium compounds are poisonous when taken into the stomach.

13. Buehligen's Depilatory.—A mixture of 2 or 3 parts sulphide of arsenic with 15 parts pulverized quicklime.

Dry, Stiff or Obstinate Hair.—Men should use ½ teaspoonful, women 1 teaspoonful olive oil, every morning. The hair should be washed daily in glycerine 5 parts; water 50 parts. It should be parted if possible in that direction in which it most easily falls. The brush should be used freely.

Hair Dyes.—Where, from some personal idiosyncrasy, the color of the hair has disappeared and cannot be restored, a dye may be considered neccssary, the following will be of service; but the nitrate of silver dyes should be avoided and the use of any dye for prolonged time is detrimental to the hair.

1. Brown:

Walnut skins beaten to a pulp	4 oz.
Rectified spirit	16 oz.

The above is perfectly innocent in its character.

The following is original, and non-injurious:

2. Black:

Sulphate of iron	10 grn.
Glycerine	1 oz.
Water	1 pt.

The hair must be thoroughly washed with this, dried and brushed once daily for three days; then the following should be applied on a small tooth comb, but it should not be allowed to touch the skin if the other preparation has done so, as a temporary stain would result.

3. Gallic acid

Gallic acid	4 grn.
Tannic acid	4 grn.
Water	1½ oz.

After the first application of Formula 2. the hair should be allowed to dry and then be brushed. Subsequently, both formulæ may be used once daily at an interval of an hour or so, until a black color is produced.

All preparations of lead and mercury are injurious if used for any length of time; they may, however, be legitimately used where some small portion of hair has, from personal idiosyncrasy, lost its color, which cannot be restored.

4. Brown:

Litharge	1 part.
Slaked lime	2 parts.
Starch	2 parts.
Milk sufficient to make a paste.	

Black, as above, but in place of milk use water.

The head must be covered after using these to prevent evaporation.

5. Black—Slaked lime, 2 parts; carbonate of lead, 1 part; mixed with water and applied as the last.

6. Black.—Silver nitrate, 11 drm.; nitric acid, 1 drm.; water, 1 pt.; sap green, 3 drm.; gum arabic, 1½ drm.

7. Black.—Nitrate of silver, 1 drm.; distilled water, just so much as will dissolve it. Bottle and keep in the dark. In another bottle place 2 drm. of gallic acid in a ½ pt. of hot water. After washing the hair use the gallic acid, and when it is nearly dry the silver solution. The dye may be lightened in color by adding more water to the silver solution.

8. Prof. Redwood:

Litharge	2 oz.
Fresh slaked lime	1 oz.
Powdered starch	1 oz.

mix. For use, add of—

Liquor of potassa	2 fl. drm.
Water, to form a thick cream	q. s.

and stir the whole briskly for some time. The proportions here are excellent; but, owing to the caustic nature of the liquor of potassa, it is advisable to wet the paste up about an hour before applying it, and to stir it frequently during the whole time.

9. Lime, slaked by exposure to damp air 2 parts.
Carbonate of lead, pure white lead 1 part.

mix thoroughly, pass the mixture through a gauze sieve, and at once bottle it and preserve it from the air. Used as the preceding, but acts in one-third or one-fourth the time. The

shade depends chiefly on the length of its application. Not recommended.

10. Chevallier:

Fresh slaked lime	5 drm.
Water	1½ oz.

mix, strain through gauze, and pour the milk into a 4 oz. bottle. Next take of—

Sugar of lead	5 drm.
Water	3 oz.

dissolve; add to this solution—

Dry slaked lime	1 drm.

and agitate them well together for a few minutes. Wash the resulting precipitate with a little distilled or soft water, drain it and add it to the milk of lime in the 4 oz. bottle. Lastly, shake the whole well together, and again before use, if it be not at once applied. It must be kept well corked. As the last, but acts much more quickly.

11. Silver Dyes.—The old forms of these were the two following:

Nitrate of silver, cryst.	1 drm.
Distilled water	1 oz.

dissolve. Used undiluted, as noticed below; it dyes the hair black; diluted with an equal bulk of pure water, deep brown and chestnut; and with twice its bulk of water, light brown and auburn; all of which may be modified by the mode of using it. The color it produces also depends on that of the hair to which it is applied.

12. Nitrate of silver, cryst. 1 to 1½ drm.
Distilled water 2 oz.

dissolve. For browns of different shades, diluted, as before, according to the result desired. Hair moistened with either of the preceding gradually changes its color by exposure to the light, and almost immediately on exposure to sunshine.

13. Nitrate of silver, 30 grm.; sulphate of copcopper, 2·5 grm. Dissolve the two salts in 250 cubic centimeters of water, and add sufficient ammonia to dissolve the precipitate formed, and make it up to one liter.

An instantaneous dye may be made by steeping the hair in a solution of pyrogallic acid in acetic acid, and then in the argenti-cupric solution dissolved above. The hair should be allowed to dry partially after the application of the pyrogallic solution. By varying the proportion of the pyrogallic acid from 1 grm. to 50 grm. per liter, any tint may be obtained from light brown to black.—*Moniteur Scientifique.*

14. Pyrogallic Hair Dye (Pyrogallic Stain):

Pyrogallic acid	¼ oz.
Distilled water, hot	1½ oz.

dissolve, and when the solution has cooled, gradually add of—

Rectified spirit	½ fl. oz.

It may be made a little stronger or weaker, at will.

The pyrogallic stain of the shops is commonly made by the dry distillation of Aleppo galls, coarsely powdered, in a retort with a short wide neck, dissolving the solid acid, which sublimes in a little hot water, and after mixing this solution with the acid liquor which also passes over, adding a little rectified spirit. The oil floating on the surface is then skimmed off, or otherwise separated, and the liquid either decanted or filtered.

15. The hulls of green walnuts are pounded up, and the juice expressed by squeezing in a tincture press. The juice is then rubbed up with olive oil.

16. The juice as expressed is used mixed with a little rectified spirits and perfumed with oil of cloves, the latter acting as a preservative. The whole is allowed to stand for a week or two with occasional agitation, and the clear solution is eventually decanted. Sometimes salt is used to preserve it. These dyes stain the skin very strongly.

17. The simplest form is the expressed juice of the bark or shell of green walnuts. To preserve the juice, a little alcohol is commonly added to it with a few bruised cloves, and the whole digested together, with occasional agitation, for a week or fortnight, when the clear portion is decanted, and, if necessary, filtered. Sometimes a little common salt is added with the same intention. It should be kept in a cool place. The most convenient way of application is by means of a sponge.

18. Hair Dye, Yellow.—Moisten the hair, previously washed and dried, with a solution of acetate or nitrate of lead, and follow with a mordant of yellow chromate of potash.

19. Hair Dye, Blonde or Flaxen.—Mix 5 oz. distilled water, ½ oz. acetate of iron, ½ oz. nitrate of silver, and 1 oz. nitrate of bismuth; moisten the hair with this mixture, and after an hour, touch it with a mixture of equal parts of sulphide of potassium and distilled water.

Lustral Fluid.—Take 1 oz. of wax to 1 lb. of oil; otto of bergamot, 1 oz.; otto of lemon, ½ oz.; otto of lavender, 2 drm.; otto of cloves, 1 drm.

Philocome, Friend to the Hair.—White wax, 10 oz.; fresh rose oil, 1 lb.; acacia oil, ½ lb.; *jasmine oil*, ½ lb.; *fleur* d'orange oil, 1 lb.; tuberose oil, 1 lb. Melt the wax in the oils by a water bath at the lowest possible temperature. Stir the mixture as it cools; do not pour out until it is nearly cool enough to set. Let the jars be slightly warmed.

Philocome (second quality).—White wax, 5 oz.; almond oil, 2 lb.; otto bergamot, 1 oz.; otto of lemon, ½ oz.; otto of lavender, 2 drm.; otto of cloves, 1 drm.

Sea Foam for Barbers.—Dissolve in 8 oz. alcohol 2 oz. castor oil, 1 oz. ammonia. Add this mixture to 1 qt. water.

Hair Oils.—Camphorated Oil.—Olive oil in which 5 or 6% camphor (crushed) has been dissolved, by means of a gentle heat. A popular application in weak and failing hair. To increase its action, a little oil of thyme, rosemary, or nutmeg, should be added to it.

Cocoanut Hair Oil:

Cocoanut oil	½ pt.
Castor oil	½ pt.
Alcohol	6 pt.
Slippery elm bark	1 oz.
Water	4 oz.
Oil of bergamot	1 oz.
Oil of lemon	½ oz.
Oil of pimento	¼ oz.
Oil of almonds	1 drm.

The cocoanut oil is mixed with the castor oil, and the alcohol mixed slowly with them at a slight heat. The elm bark in coarse powder is dissolved in the water and strained, and mixed by agitation with the rest. Lastly it is filtered, perfumed, and colored with a little tincture of gamboge.

Hair Oil.—Castor oil, ½ pt.; 95% alcohol, ½ pt.; tincture cantharides, ½ oz.; oil of bergamot, 2 drm. Color a pale pink with alkanet root.

Macassar Oil.—

Oil of ben or almonds (reddened)	1 pt.
Oil of rosemary	1 drm.
Oil of origanum	1 drm.
Oil of nutmeg	15 drops.
Otto of roses	15 drops.
Neroli	6 drops.
Essence of musk	3 or 4 drops.

Mix, as before.

Huile de Macassar (Macassar Oil), of Naquet.—

1. Oil of ben	8 qt.
Oil of noisette	4 qt.
Alcohol	1 qt.
Essence bergamot	3 oz.
Spirit of musk	3 oz.
Spirit of Portugal	2 oz.
Essence of roses	2 drm.

Mix and keep the whole over a water bath for an hour in a well closed vessel. Digest then in the same vessel for a week, stirring several times daily. Color with alkanet.

Huile de Macassar (Macassar Oil).—

2. Oil of ben	8 qt.
Oil of noisette	4 qt.
Alcohol	1 qt.
Essence bergamot	3 oz.
Essence rose	2 drm.
Spirit of musk	3 oz.
Spirit of Portugal	2 oz.

Mix and digest precisely in the same manner and for the same length of time as for the preceding. This oil, however, is preferable to Naquet's, from its property of keeping much longer. Color with alkanet.

To Make the Hair Curl.—

Olive oil	1 lb.
Oil of origanum	1 drm.
Oil of rosemary	1¼ drm.

Oil of Roses.—

Olive oil	1 pt.
Otto of roses	16 drops.

Common Oil.—

Rectified spirit	1 pt.
Sweet oil	3 pt.

Stimulating Pomatum.—

Almond oil	¼ lb.
White wax	½ oz.
Clarified lard	3 oz.
Liquid ammonia	¼ oz.
Oil of lavender	1 drm.
Oil of cloves	1 drm.

Marrow Oil.—

Clarified beef narrow	1½ oz.
Oil of almonds	¼ pt.

Melt them together, and scent the mixture at will. *Held in high repute as a hair oil by many.* That of the shops has seldom any marrow in it, but lard instead. The appropriate scents are the same as for bears' grease. It is *generally tinged slightly yellow by means of a little palm oil or annatto.*

Huile du *Phénix*, or Baume Nerval.—

Beef marrow, purified	4 oz.
Lard, purified	2 oz.
Concrete oil mace	4 oz.
Oil of cloves, lavender, mint, rosemary, sage and thyme, each	2 drm.
Balsam of *tolu*	4 drm.
Camphor	1 drm.
Alcohol 36° Baume	1 oz.

Place the alcohol in a glass matrass, and, by the heat of a water bath, dissolve therein the balsam tolu. This done, add the camphor and essential oils. On the other hand, melt together the marrow, lard, oil of mace, and, as it congeals, add the alcoholic solution first made, and stir the whole well until it is entirely cooled.

Bear's Grease.—Take washed hog's lard (dry) 1¼ lb., melt it by the heat of a water bath, add balsam of Peru, 2 drm.; flowers of benzoin and palm oil (bright), 1 drm. of each. Stir vigorously for a few minutes. Then remove the pan and after repose for a short time, pour off the clear portion from the sediment and stir the liquid mass until it begins to cool.

Bear's Oil. Huile de Graisse d'Ours.—

Bear's grease body	8 oz.
Beef tallow body	2 oz.
Oil of alder	1 drm.
Oil of sage	1 drm.
Benzoin	4 drm.
Musk	½ drm.

Prepare this as directed for the preceding oils.

Mixed Essential Oils; Mixed Scents.—

1. Oil of bergamot	1 oz.
Oil of lemon	1 oz.
Oil of lavender (English)	½ oz.
Oil of pimento	½ oz.

Mix.

2. To the last add of—	
Oil of orange peel	2 drm.
Oil of cloves	1 drm.
3. Oil of bergamot	3 drm.
Oil of lemon	3 drm.
Oil of orange peel	3 drm.
Essence de petit grain	2 drm.
Oil of cloves	1½ drm.
Oil of cassia	1 drm.

Mix.

The above are used as extemporaneous scent for smelling bottles, hair oil, pommades, esprits, sal volatile drops, etc; for which purpose one or other of them is commonly kept at hand by the druggists. 1 oz. of any one of them, added to a pt. of rectified spirit, produces an agreeable esprit or perfume for personal use.

Huile Royale, Oil of Ambergris and Musk.—

Ambergris	2 drm.
Grain musk	½ drm.
Oil of lavender (English)	20 drops.
Oil of cassia	10 drops.
Oil of cloves	10 drops.
Oil of nutmeg	10 drops.
Neroli	10 drops.

and proceed by infusion. Very fine. The ingredients are worked over a second time, as with oil of musk.

Hair Oil Perfume.—The quantities are for 1 qt. of hair oil.

1. Heliotropin	8 grn.
Coumarin	1 grn.
Oil of orris	1 gtt.
Oil of rose	16 m.
Oil of bergamot	32 m.
2. Coumarin	1 grn.
Oil of lemon	16 m.
Oil of bergamot	48 m.
3. Coumarin	1 grn.
Oil of bitter almond	2 gtt.
Oil of cassia	2 gtt.
Oil of lavender flower	32 m.
Oil of lemon	48 m.
Oil of bergamot	80 m.
4. Coumarin	2 grn.
Oil of wintergreen	2 gtt.
Oil of clove	4 gtt.
Oil of cassia	4 gtt.
Oil of lavender flower	16 m.
Oil of lemon	48 m.
Oil of bergamot	72 m.

Oil of Vanilla; Huile à la Vanille.—

Vanilla (finest in powder)	2½ oz.
Oil of bergamot	1 fl. drm.
Otto of roses	15 drops.
Ambergris	3 grn.
Oil (almond or olive)	1¼ pt.

by infusion. Very fragrant. For the simple oil, the bergamot, otto and ambergris, are omitted.

Hair Powder. See **Powders.**

Shampoo Liquid, American Shampoo Liquid.—

1. Sesquicarbonate of ammonia	2 drm.
Carbonate of potash	2 drm.
Soft water	¼ pt.

dissolve and add the solution to a mixture of—

Tincture of cantharides	1½ fl. oz.
Rectified spirit	¼ pt.
Good rum	1½ pt.

and agitate the whole well together, adding a little scent, or not, at will. This preparation, too, has been highly puffed for removing dandruff, preventing the hair falling off, etc. In using it, the hair is wetted with it, well rubbed so as to form a lather, and then either washed with cold or lukewarm water, or rubbed dry with

a towel and at once arranged with the brush and comb. A commoner kind, in which the rectified spirit and one-third of the rum is replaced by water, forms the shampoo liquid often used by the hairdressers after cutting the hair.

2. This very fashionable liquid, now in such prevalent use for removing the dandruff from the hair, is made by mixing together—

New England rum	3 qt.
Bay rum	1 qt.
Water	1 pt.
Glycerine	2 oz.
Tinct. cantharides	½ oz.
Carb. ammonia	½ oz.
Borax	1 oz.

Dissolve the last two in the water and add the solution to the other materials mixed together and then shake up well. The hair is moistened with this liquid and the slight lather occasioned by rubbing with the hands must be washed out with water. By doubling the quantity of borax the lather is more soapy, but the addition is injurious to the hair.

3. Cream of tartar, 1 oz.; alcohol, 8 oz.; water, 1 oz.; perfume, if desired.

4. Ammonia, 1 oz.; saltpeter, ½ oz.; best caustic soda, finely shaved, 12 oz.; perfume to suit. Not recommended.

5. Ammonia, 3 oz.; cream of tartar, ¼ oz.; alcohol, 2 oz.; water, 1 pt.; perfume, if desired.

Shampoo Creams.—

1. New England rum	1 pt.
Bay rum	¾ pt.
Glycerine	2 oz.
Carbonate of ammonia	1 oz.
Borax	2 oz.
2. Carbonate of potash	2 oz.
Bay rum	2 oz.
Rose water	1 pt.
Water	1 pt.
3. Carbonate of ammonia	½ oz.
Carbonate of soda	½ oz.
Rum	½ pt.
Water	1 pt.

Hair Washes, Tonics, Invigorators and Miscellaneous.—To gradually darken the hair:

Sulphate of iron (green, crushed)	1 drm.
Rectified spirit	1 fl. oz.
Oil of rosemary	10 or 12 drops.
Pure soft water	½ pt.

Agitate them together until solution and mixture are complete. Many persons substitute the strongest old ale for the water ordered above.

Infusion of Cantharides:

Cantharides (powdered, recent)	2 to 3 drm.
Boiling water	1 pt.

Infuse, with frequent agitation, in a covered vessel, for two hours. When cold pour off the liquor, press the residuum and filter. A little spirit of rosemary or thyme may be added. Used as a shampoo liquid, also as a wash in baldness.

Lotion of Quinine, Quinine Hair Wash:

Disulphate of quinine	1 drm.
Rose water	8 oz.
Dilute sulphuric acid (sp. gr. 1·103)	15 drops.
Rectified spirit	2 oz.

Mix, then add of—

Glycerine	¼ oz.
Essence royale	5 or 6 drops.

And agitate until solution is complete. The next day decant or filter. A fashionable tonic wash in weak hair, the skin of the head being moistened with it once or twice daily.

Saponaceous Lotion, Vegetable Hair Wash:

White soft soap	1 oz.
Soft water	18 fl. oz.

Dissolve by heat. When cold, strain the solution, if necessary, and add of—

Liquor of potassa	2 fl. drm.
Rectified spirit	2 fl. oz.
Essence royale (or ess. of musk)	10 drops.

And agitate the whole well together. Used chiefly to clean the partings of the hair, being afterward rinsed off with water.

Golden Hair.—The most harmless and effective of all preparations for producing this color is peroxide of hydrogen; it is sold under various high sounding names and sometimes at an exorbitant price.

Hair Invigorator.—A correspondent of the *Lancet* states that he has found the following preparation most useful in cases of falling off of the hair:

Tincture of jaborandi	½ oz.
Lanoline	3 drm.
Glycerine	2 oz.

Mix (by the aid of a little soft soap). A little to be rubbed in every night.

Quinine Hair Tonic:

Quinine sulphate	20 grn.
Tincture of cantharides	2 fl. drm.
Fld. ext. of jaborandi	2 fl. drm.
Alcohol	2 fl. oz.
Glycerine	2 fl. oz.
Bay rum	6 fl. oz.
Rose water—enough to make	15 fl. oz.

The quinine is dissolved in the alcoholic liquids by warming slightly, then the other ingredients are added.

Stimulating Hair Lotion:

Tinct. of cantharides	3 fl. drm.
Tincture of capsicum	1 fl. drm.
Ammonia	2 fl. drm.
Glycerine	2 fl. drm.
Cologne water—enough to make	16 fl. drm.

Astringent Hair Tonic:

Tannin	1 drm.
Tincture of myrrh	1 fl. oz.
Glycerine	5 fl. oz.

Salicylic Hair Tonic:

Salicylic acid	50 grn.
Borax	2½ drm.
Tincture of cantharides	1½ fl. oz.
Bay rum	6 fl. oz.
Rose water	6 fl. oz.
Boiling water—enough to make	18 fl. oz.

Athenian Water.—Rose water, 1 gal.; alcohol, 1 pt.; sassafras wood, ¼ lb.; pearlash, 1 oz. Boil the wood in the rose water in a glass vessel; when cold, add the pearlash and spirit.

Wash for Falling Hair.—Try the following: Iodine (crushed small), ½ drm.; olive oil (lukewarm), ¼ pt.; agitate them together in a small phial until solution is complete. It may be scented with a little essential oil of almonds or lemons; but it is better without it. Most of the other oils cause the gradual decomposition of the hair. It has been very highly recommended as a hair oil for daily use in partial loss of hair and baldness, also to rub indurated glands, etc., with.

Hair Preservative.—A decoction of the burdock root (bardanus) is the safest wash for the scalp to promote the growth of the hair and strengthen the skin so as to prevent the falling out of the hair.

Harmless Hair Restorative.—The same authority remarks: The basis of all the best lotions for restoring hair is cantharides or ammonia. A solution of borax in camphor water is useful. It cleanses the roots of the hair, and acts very slightly as a stimulant; and thereby it will serve to promote the growth of the hair.

But one of the best stimulants we know of that has not hitherto been published, is this:

Vinegar of cantharides	1 fl. oz.
Glycerine	2 fl. oz.
Rose water	6 fl. oz.

Mix well. Let the mixture stand for twenty-four hours, and filter.

Hair, to Prevent from Falling Out.—Glycerine and tincture capsicum, each 2 oz.; oil of bergamot, 1 drm.; mix and perfume to suit. This is to be the only dressing for the hair. Wash the head occasionally with soft water and fine soap.

Beard Promoter.—Croton oil 12 drops, sweet oil of almonds ½ oz. troy. Mix and rub on skin gently twice a day. If too irritating, double the amount of sweet almond oil. It is poisonous.

Glycerine Hair Wash.—Glycerine, 2 fl. oz.; water, 6 fl. oz.; oil of rosemary, 6 drops. Mix together. This is an excellent remedy against dandruff.

Hair Tonic.—One oz. of sage and steep it in boiling water for ten minutes; strain and add 2 oz. glycerine, ¼ oz. powdered borax, ¼ oz. lac sulphur, ¼ oz. tincture of cantharides, bergamot sufficient to perfume. Apply twice a week with the hand, and rub thoroughly in. It will remove dandruff and strengthen the growth. It will also, it is said, prevent gray hairs.

Scurf or Dandruff.—The scientific name of this is *pityriasis*; it is characterized by the production of a white, brittle scarf skin, which sheds itself in small scales. The affection is not confined to the scalp, although it generally attacks parts covered by hair.

The treatment consists in daily washing of the head or other parts affected with—

Warm water	1 pt.
Glycerine	½ oz.

This should be thoroughly rubbed over the skin; the dilute citrine ointment (sold by all chemists) may be used at night. A good preventive, and in mild cases, a curative wash is—

Water	1 pt.
Borax	1 oz.

As a preventive, it should be used once weekly; as a curative, twice daily.

It sometimes happens that the disease attacks parts uncovered by hair, and it has, in error, been termed scorbutus, or the scorbutic complaint. Dandriff, or *pityriasis simplex*, is totally distinct from scorbutus, or scurvy. The latter is brought about by abstinence from vegetable food, and nearly always removed when the latter is supplied; and, moreover, it is a disease characterized by rottenness of the gums, foul ulcers, and wasting of the body.

When dandruff occurs on uncovered skin, the part must be constantly moistened with glycerine, and dilute citrine ointment should be used at night. Every night, each square inch of the affected skin is to have rubbed in a piece of the following ointment, the size and thickness of a quarter dollar.

Chrysophanic acid	1 drm.
Lard	1 oz.

Once every day the following is to be freely applied:

Carbonate of bismuth	1 oz.
Glycerine	1 oz.
Milk	2 oz.
Rectified spirit	1 oz.

This is to remain on for half an hour, and to be washed off with—

Water	1 pt.
Glycerine	1 oz.

Baldness, to Prevent.—It is recommended for the prevention of baldness that the hair be kept pretty closely cropped, and that the head be bathed frequently in salt water and lubricated occasionally with a very small quantity of vaseline. Two teaspoonfuls of salt to a pint of water will make a tonic of the proper strength, and with this the head should be bathed three times a week.—*Med. Rec.*

World's Hair Restorer contains, says Wittstein, 5·6 grn. sulphur, 8 grm. sugar of lead, 100 grm. glycerine and 200 grm. aromatic perfumed water.

Lanolin Hair Cream:

1. Crême d'Amand	1 drm.
Glycerine	1 drm.
2. Ol. amygd	6 drm.
Lanolin	½ oz.
Otto de rose	8 gtt.
3. Tinct. canthar	2 drm.
Aquæ ad	4 oz.

Mix in separate mortars the first two lots; gradually add No. 2 to No. 1, then stir No. 3 gradually in.

Drying Washes for Moist, Lax Hair:

Essential oil of almonds	1 fl. drm.
Oil of cassia	½ fl. drm.
Essence of musk	½ fl. drm.
Rectified spirit	2½ fl. oz.

mix, and add gradually, with brisk agitation—

Distilled water	10 oz.

in which has been dissolved—

Gum arabic (finest)	1 oz.

The hair and scalp is slightly moistened with the liquid, and the hair at once arranged (without wiping), while still moist.

Hair, Damp.—If the hair is persistently damp a wash may be made with: Water, 1 pt.; table salt, 1 teaspoonful. This may be used once or twice daily, and the hair thoroughly combed and brushed after its application. Its long continuance tends to lighten the hair.

Hair, False, to Restore.—To bleach or restore a switch of white hair which has turned yellow, clean thoroughly and expose it moist to the vapor of burning sulphur in a box.

Glycerine Hair Tonic.—Glycerine, 2 fl. oz.; alcohol deodorized, 12 fl. oz.; castor oil, 2 fl. oz.; oil of rosemary, 20 drops, or any other perfume. Dissolve the castor oil and oil of rosemary in the alcohol and add gradually the glycerine.

Hair Washes (Eaux pour les Cheveux).—To strengthen and improve the growth of the hair:

1. Rosemary tops | 2 oz.
Boiling water | 1 pt.

Infuse in a teapot or covered jug until cold, then express the liquor and add to it of—

Rectified spirit	1 fl. oz.

or—

Good Jamaica rum	2½ fl. oz.

and shake them well together.

2. Box leaves | a small handful.
Boiling water | 1 pt.

Infuse as before and add to the expressed liquor or not, at will, of—

Jamaica rum	2½ fl. oz.

3. As the last, but substituting good black tea, 1 oz. for the box leaves. These are all popular favorites.

4. Erasmus Wilson.—

Eau de Cologne (strongest)	8 fl. oz.
Tincture of cantharides	1 fl. oz.
Oil of lavender (English)	½ fl. drm.
Oil of rosemary	½ fl. drm.

Mix. More energetic than the preceding. It is improved by the addition of ½ fl. drm. of oil of origanum, or by its substitution for the oil of lavender, but the omission of the latter renders it less odorous.

A Safe Hair Dressing.—The following is from the *Year Book of Pharmacy* for 1872:

Oil of cocoanut	12 oz.
Castor oil	3 lb.

Melt the cocoanut oil and add then the castor oil; agitate until they are thoroughly mixed and add strong alcohol, 4 pt.

Tricopherous.—Castor oil, ¾ pt.; alcohol 95%, ¾ pt.; tincture cantharides, ¾ oz.; oil of bergamot, 3 drm. Color a pale pink with alkanet root.

White Batons or Cosmetics.—Suet, 1 lb.; wax or paraffine, ½ lb.; otto of bergamot, 1 oz.; otto of cassia, 1 dr.; otto of thyme, ½ dr.

Hair Washes—Stimulating:

Rose water	½ pt.
Rectified spirit	½ pt.
Tincture of arnica	½ oz.
Dilute liquid ammonia	2 drm.

Bandoline for Hair.

Quince seeds	1 part.
Hot water	4 parts.

Eau de Cologne.

Alcohol	2 qt.
Oil of neroli of orange	3 drm.
Oil of rosomary	1½ drm.
Oil of orange zest	1 oz.
Oil of bergamot	3 drm.

Hungary Water.

Rectified spirit	1 gal.
Oil of neroli of lemon	1½ oz.
Oil of petch grain	½ oz.
Oil of orange	½ oz.
Oil of rosemary	½ oz.
Oil of citron zest	¼ oz.
Oil of neroli of orange	⅛ oz.

Eau de Bouquet.

Rectified spirit	1 pt.
Spirit of rosemary	½ oz.
Essence of violets	½ oz.
Essence of bergamot	½ drm.
Essence of jasmine	½ drm.
Oil of verbena	¼ drm.
Oil of lavender	¼ drm.
Rose water	¼ pt.
Orange flower water	½ oz.

Eau sans Pareille.

Bergamot essence	½ drm.
Essence of lemon	1 drm.
Essence of citron	½ drm.
Hungary water	2 oz.
Rectified spirit	1½ pt.

Washes for Failing Hair and Baldness.—Those of the shops mostly contain tincture of cantharides as their active ingredient. The following is a good formula:

1. Tincture of cantharides	2½ fl. oz.
Jamaica rum, strong, good	2½ fl. oz.
Glycerine (Price's)	1 oz.
Sesquicarbonate of ammonia, crushed	2 drm.
Oil of origanum	15 drops.
Oil of rosemary	15 drops.

mix, add of—

Distilled water	9 oz.,

and agitate the whole well together. The skin of the head to be moistened and rubbed with it twice daily. It will keep the hair soft and moist like oil. Liquor of ammonia may be substituted for the sesquicarbonate. It may be diversified by omitting the ammonia altogether, or by substituting ½ drm. of oil of nutmeg for the rosemary and origanum.

The following are in less frequent use, but have been highly extolled for their efficacy by certain writers:

2. Iodide of potassium	2 drm.
Rosemary water	1 pt.

dissolve, and add a little eau de Cologne or lavender to scent it.

3. To the last add of—	
Tincture of iodine	¼ fl. oz.
4. Phosphureted oil	1 oz.
Mucilage, thick	1 oz.
Glycerine (Price's)	½ oz.
Distilled water	½ pt.

Form them into an emulsion, adding a few drops of essence of roses and of musk, to scent it.

Hall Marks.—Hall mark, the official stamp of the British Goldsmiths' Company and other authorized assay offices on gold and silver articles to guarantee their purity.—The standard silver of England is an alloy, containing, in 1,000 parts, 925 parts silver and 75 copper. Originally the Goldsmiths' Company had a monopoly of gold and silver work in England. The company is still authorized to search the shops of silversmiths and seize articles which do not bear the hall mark of the company. A charge of 1s. 6d an oz. is made for assaying and stamping, the larger portion of the revenue so derived being paid over to the government.

Halogens.—Chlorine, bromine, iodine and fluorine are called the halogens, because they form a peculiar series of salts called the haloid salts. Thus cadmium bromide and potassium iodide are haloid salts.

Hams, Curing.—1. Few persons understand the proper ingredients and exact proportions to make a suitable pickle for curing hams. This information will doubtless prove of value. The desideratum is to cure the meat so that it will keep in hot weather, with the use of as little salt as possible. Pickle made in the following manner, it is believed, will accomplish this:

1¾ lb. salt—coarse or alum salt is best.
½ oz. saltpeter.
1 pt. molasses or 1 lb. brown sugar.
1 teaspoonful saleratus.

Let these be added to 1 gal. of water, and the amount increased in the same proportions to make the quantity required. Bring the liquor to a boil, taking care to skim just before it begins to boil. Let the pickle cool, and pour it over the meat until entirely covered. The meat should be packed in clean, tight casks, and should remain in the pickle six or seven weeks, when it will be fit to smoke. Green hickory wood is the best article for this purpose. Shoulders prepared in the same way are nearly as good as hams. This pickle is just the thing to make nice corned beef, or corned beef tongues, or any lean meat for drying.—*Valley Farmer.*

2. To 1 gal. water, take 1½ lb. salt, ½ lb. sugar, ½ oz. saltpeter, ½ oz. potash.

In this ratio the pickle can be increased to any quantity desired. Let these be boiled together until all the dirt from the sugar rises to the top, and is skimmed off. Then throw it into a tub to cool, and when cold, pour it over your beef or pork, to remain the usual time—say four or five weeks. The meat must be well covered with pickle, and should not be put down for at least two days after the killing, during which time it should be slightly sprinkled with powdered saltpeter, which removes all the surface blood, etc., leaving the meat fresh and clean. Some omit boiling the pickle, and find it to answer well, though the operation of boiling purifies the pickle by throwing off the dirt always to be found in salt and sugar.

3. Take a large cask (if possible one between 100 and 120 gal.), and after covering the bottom with salt, lay in a ham with the skin side to the bottom, then sprinkle another layer of salt, put in another ham, etc., till the cask is full. A fluid is then made of the proportions of 3 gals. water, 4½ lb. salt, 2 lb. brown sugar, 1½ oz. salpeter, 1 oz. saleratus. When this is skimmed, scalded, and has gotten cold, it is poured over the hams until it covers them entirely. They should remain in this pickle for from thirteen to fourteen weeks.

Hands (The). See the **Skin.** See also (The) **Nails** and **Skin.**

Hardening. See also **Tempering** and **Casehardening.**

Hardening Fluid.—Rosin, 25 lb.; train oil, 12 lb.; lard, 5 lb.; asafetida, 1¼ lb.

Zinc, to Harden.—From 1½ to 3½ oz. of sal ammoniac are added to the molten metal. This yields a metal which can be easily worked with tools.

Cast Iron, to Harden.—One lb. of strong concentrated sulphuric acid and 1 oz. nitric acid are added to 1 to 1½ gal. of water, and the iron heated to a fine cherry red is plunged in this.

Hardening Compound for Thin Steel.—1. Beef suet, 3 lb.; train oil, 1½ gal.; wax, 6¾ oz.; add 1½ lb. rosin.

2. Spermaceti oil, 47½ parts; melted tallow, 5 parts; neat's foot oil, 2¼ parts; pitch, ¼ part; rosin, ¾ part.

Hardening Cutlery.—1. Sal ammoniac, 6 lb.; refined borax, 3 lb.; water, 4½ qt.; red wine, 6 oz.

2. Water, 6 gal.; potash, 1½ lb.; sal ammoniac, 4½ lb.; red wine or wine vinegar, 2¼ pt.; tartaric acid, 1½ lb.

Hardening of Small Work.—Put soap on the pieces before heating. Use muriatic acid, 1 part; water, 2 parts; for cleaning the pieces when made black by hardening.

Expansion of Wrought Iron and Cast Steel.—It is important in workshop manipulation to remember that if a piece of cast steel be made red hot, and quenched in cold water, it will become longer, but if the same operation be performed upon a piece of wrought iron it will become shorter.

Copper, to Harden.—Mix thoroughly when in a molten condition with from 3% to 5% of manganese oxide.

Hardening Steel Cutters.—For cutters 3 in. and upward in diameter, the hardening process is a hazardous one and causes some anxiety. In the first place, the lowest temperature at which the steel will harden should be ascertained. If at a blood-red heat so much the better. The cutter when roughed out to near the size before the finishing cut is taken off should be well annealed. This precaution is too often neglected. Whether for large taps, lathe mandrels, or cutters, it will be found after the annealing, that a degree of warpage has taken place, showing that the steel, though soft, was, nevertheless, in a state of tension, and this preliminary annealing greatly lessens the tendency to crack in the hardening. For a cutter of 3 in. in diameter, a large clear fire of cinders should be used, great care being taken to heat the work uniformly. The cutter should be smeared over with a paste of soap and leather charcoal. This causes the finished cutting edges to come out bright and quite hard, after the quenching. Before hardening taps and drills, it is my custom to rub a piece of soap over them before heating, as no scale is then formed, and they come out clean after quenching. For large cutters, etc., in order to lessen the risk of cracking during the quenching, I should pour oil over the water to the thickness of a card.

Hardening Drills.—Drills used for riveting glass and china are made of fragments of diamond, and these, of course, require no hardening. For steel drills harden them as jewelers do their small tools—viz., heat to a cherry red and plunge into sealing wax, quickly withdraw and insert in a fresh place, and repeat this operation until too cold to enter the wax. In using a steel drill for glass it is advantageous to keep it moistened with turps, or better still, a solution of camphor in turpentine.

To Harden Steel Drills and Other Instruments. Any piece of steel wire can be made into a drill of such hardness that it will easily penetrate glass, or into an engraving tool, with which to graduate bottles, etc. In the first place, shape the wire as desired by filing, then mix 4 parts powdered resin and 2 parts fish oil with one part tallow heated to the melting point. Heat the wire or other object to be hardened to dull redness, dip it into the mixture and leave there until perfectly cold. After that it is heated again and dipped into cold water until the desired degree of hardness is obtained.

Watch Drills.—A simple way of hardening small watch drills: Heat the tools in the flame of a candle and then plunge suddenly in the candle grease. This is done on account of the drills being so small that they will not retain their heat sufficiently long to enable the operator to remove them from the source of heat to a vessel containing water used for hardening.

Sealing Wax, Hardening in.—Heat the steel article to a white heat and plunge into the sealing wax. After an instant withdraw and insert in a new part of the wax. Repeat the operation until the steel becomes so cold that it refuses to enter the sealing wax.

Hardening Drills and Cutting Tools for Use on Hard Steel, Chilled Iron, Glass and Other Hard Substances.—Dissolve zinc in muriatic acid to saturation. Reduce the solution by adding an equal volume of water.

For the tool use new steel or steel that has never been heated to a cherry red. Heat the tool *after it has been sharpened*, taking care not to heat it above a dull cherry red. Plunge it in the zinc chloride solution above described and hold it still until cool. Use without further sharpening.

When the tool becomes dull, grind it as little as possible to sharpen. If it does not stand well after grinding, reharden.

Use the usual lubricants for drills and cutters; oil, or soap water for tempered steel; turpentine for glass, very hard steel and chilled iron. This receipt is very highly recommended.

Cast Iron, to Harden.—One lb. of strong sulphuric acid is mixed with 1½ gal. water and 1 oz. of nitric acid. Heat the iron in a clean fire to a cherry red and plunge into the mixture.

Steel, to Harden on the Outside.—The following is said to keep the inside soft while the outside remains hard. Borax and potassium nitrate, 3 parts of each; yellow prussiate of potash, 10 parts; lead acetate, 1 part. Grind the materials up fine and mix them thoroughly. When the steel is heated to red heat sprinkle over some of the powder, return to the fire until the proper color is reached, then cool in rain water.

Mill Picks.—The only peculiarity in hardening mill picks is to leave the edge thick, say $\frac{1}{8}$ in. Harden at the lowest heat that the particular kind of steel will take, in clean water at about 60°. Draw temper as little as possible, which may be ascertained by trial at a straw color to begin with. Do not draw temper with the same heat used for hardening. The pick after hardening should be tried with an old fine file, which by a little experience will tell you if the hardening is even. Then grind and heat from the center for color drawing. If you use low grade steel of first rate quality, the color temper may be dispensed with. The greatest difficulty is caused by burning the corners in forging or in heating to harden. Therefore use a dull charcoal fire if possible with light blast. Blast often ruins the finest steel.

Small Screws, to Harden.—I know of no liquid for the purpose. Get some charcoal and reduce it very fine; now take 1 part of prussiate of potash and 2 parts common table salt, powder these and dissolve them in hot water, just enough to keep them in solution; wet the charcoal into a paste with it, and imbed your articles in it in a sheet iron pan; place in a slow fire and subject them to a nice red heat, and if very small you will not want the hardening to penetrate too deep. Five minutes will do, but the longer they are subjected to the process the harder they will be and the deeper. Plunge them into cold water, box and all. By this means you will have them clean and hard and will not lose any in the fire.—*Correspondent in English Mechanic.*

Steel, to Harden.—To 1 lb. prussiate potash add 3 lb. common salt, 2 oz. borax and 2 oz. cyanide potash. Place the same in a crucible and place the same over a fire; when hot put the steel in the mixture and there let it remain until hot, after which immediately plunge it in water until cool. This prevents the steel from cracking or warping, and will give perfect satisfaction.

Schaefer's Fluid for Hardening Steel.—This fluid is composed of resins, linseed oil, glycerine and powdered wood charcoal. Heat and mix thoroughly. Heat the steel to a fine, bright cherry red and drop in the fluid and let it remain until cold. Burnt cast steel regains its properties when hardened in this fluid.

Taps and Dies, to Harden.—A writer in the Chicago *Journal of Commerce* gives his experience in tempering as follows:

The great difficulty in hardening tools is principally their liability to twist or get out of true; second, cracking (especially if large) after hardening; thirdly, getting the right temper. In our factory we use a great number of small taps and rimers; some of the rimers are 9 in. long and quarter of an inch in diameter; these we harden very successfully, not more than one out of a dozen being out of true. Our plan is as follows: First, carefully select your steel; let it be of the best cast, with a medium grain (a fine grained steel will break when much less force is applied than a coarser grained, and, although it will take a keener edge, it will not resist the strain required by a tap or rimer). Next center it, and turn off the scale and soften. The object of softening after the scale is removed is to make the grain of the steel equal throughout; if it be softened with the scale on, it will generally cast. To soften, inclose the articles in a piece of gas tube, filling up with wrought iron turnings and plugging the ends with clay, making the whole red hot and allowing it to cool very slowly—*i. e.*, leaving it in hot ashes all night. This method makes the steel very soft, and equalizes the grain. After softening turn up the work, taking care not to bend it or straighten it, should it have cast, as it probably will in the process of softening. The reason for this is that, if the steel be bent or hammered, the grain will be closer in one place than another, and heat has a great tendency to bring it back to its original position. The next thing after finishing your tool is to harden it; first slightly heat it over a gas or other flame, and rub it all over with a mixture of Castile soap and lampblack. This is to prevent the edges from being burnt. The next is to get a thick iron pipe (the size we use is 2 in. diameter and three-fourths bore). This is well filled up with taps or rimers and charcoal dust, the ends being closed with clay as before. This is placed in the furnace and occasionally turned, until it is one uniform heat of cherry red, or on the outside a trifle hotter. It is then carefully removed from the fire, one end of the clay knocked off, and the contents allowed to drop perpendicularly into a solution of water, chloride of sodium and nitrate of iron; this is kept at a temperature of 60°. The articles hardened should remain at least a quarter of an hour before being removed. This method of hardening may be summed up thus: Make the steel of one grain throughout, prevent it from oxidizing while being heated, allow every part to heat at the same time, avoid bending while hot, and lastly re ore, if possible, by adding to the loss of carbon caused by heating.

Harness.—*Harness Blackings, Polishes and Waterproof Compositions.* See **Blackings.**

Harness Dressing.—The government harness dressing is as follows: One gal. neatsfoot oil, 2 lb. Bayberry tallow, 2 lb. beeswax, 2 lb. beef tallow. Put the above in a pan over a moderate fire. When thoroughly dissolved add 2 qt. castor oil; then, while on the fire, stir in 1 oz. lampblack. Mix well and strain through a fine cloth to remove sediment, let cool, and you have as fine a dressing for harness or leather of any kind as can be had.

Harness Grease.—Take ammonia soap, 4 parts; palm oil, 1 part; ordinary hard soap, 3 parts; solution of tannin (9 to 16 of tannin in 4 of water) 1¾ parts; melt the oil and soap together, then add the ammonia soap and the tannin solution and thoroughly mix. No more of this grease is to be used than the leather will absorb, and it should be kept in a stone bottle well corked. The ammonia soap is previously made by heating olive oil to boiling point, and adding sesquicarbonate of ammonium until the odor of the ammonia no longer disappears.

Harness Oil.—1. A good oil for farm and team harness is made by melting 3 lb. of beef tallow, but do not let it boil, then pour in gradually 1 lb. of neatsfoot oil and stir till cold. If properly prepared the grease will be perfectly smooth and soft; if not it will be more or less granulated. A little lampblack may be used to color.

2. Melt together 2 oz. asphaltum and 3 oz. beeswax, remove from the fire and add ½ oz. fine lampblack and ½ drm of Prussian blue in fine powder; then reduce to a thin paste with neatsfoot oil.

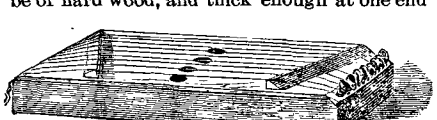
Harness, Lacquer for. See **Lacquers.**

Polish for Harness.—4 oz. glue, 1½ pt. vinegar, 2 oz. gum arabic, ½ pt. black ink, 2 drm. isinglass. Break the glue in pieces, put it in a basin and pour over it about a pint of the vinegar; let it stand until it becomes perfectly soft. Put the gum in another vessel, with the ink, till it is perfectly dissolved; melt the isinglass in as much water as will cover it, which may be easily done by placing the cup containing it near the fire about an hour before you want to use it. To mix them, pour the remaining vinegar with the softened glue into a sand pan upon a gentle fire, stirring it until it is perfectly dissolved, that it may not burn the bottom, being careful not to let it reach the boiling point—about 180° F. is the best heat. Next add the gum, let it arrive at about the same heat again; add the isinglass. Take from the fire and pour it off for use. To use it, put as much as is requited in a saucer; heat it sufficiently to make it fluid, and apply a thin coat with a piece of dry sponge; if the article is dried quickly, either in the sun or by fire, it will have the better polish.

Harness, Stains or Dyes for. See **Dyeing** (*Leather*).

Harness, Varnish for. See **Varnishes.**

Harps, Æolian.—Æolian harps should be made to fit into a window so as to adjust the sash to cause a strong breeze across the strings of the instrument. Make the box of thin dry pine, the top piece or sounding board of extra clear stuff about three-sixteenths of an inch thick. Sides and bottom can be one-quarter of an inch, length two inches shorter than the width of your window, width ten inches, depth two and a half inches. The ends should be of hard wood, and thick enough at one end



to hold the eyes or studs for fastening the wires or catgut strings. At the other end the wood should be thick enough to hold a set of violin keys, if you use catgut; or iron piano pins, if you use wire, which should be steel. Two bridges of hard wood glued diagonally across each end, for the strings to rest upon.

If steel wire is used, a round wire should be inserted upon each bridge, so that the sounding wires will not cut the wood. The rest you may gather from the sketch. The tuning should be harmonic, or say thirds, fifths and octaves. Make about four holes in sound board, one inch diameter, under the strings.

Hats, to Bleach. See **Bleaching.**

Hats, to Clean. See **Cleansing.**

Hats, to Dye. See **Dyeing.**

Hats.

To Restore Gloss to a Silk Hat.—When a silk hat becomes wet, or from other causes has lost its smoothness and gloss, cleanse it carefully from all dust, then with a silk handkerchief apply petrolatum evenly, and smooth down with the same handkerchief until it is dry, smooth and glossy. This will make a silk hat look as good as new.

Proofing for Felt Hats.—It is made of shellac dissolved in water by the aid of ammonia.

Hats, Stiffening for,—Mix 18 lb. of shellac with 1½ lb. salt of tartar (carbonate of potash) and 5½ gal. of water. Put in a kettle and boil gradually until the shellac is dissolved, when the liquid will be as clear as water. When cold dip the hats, and when nearly dry dip in a weak solution of acetic or sulphuric acid in order to neutralize the potash and cause the shellac to set.

Hats, Varnish for. See **Varnishes.**

Hats, to Waterproof. See **Waterproofing.**

Hay.—Two hundred and seventy cubic feet of new meadow hay and 216 to 243 feet from large or red stacks will weigh a ton; 297 to 324 cubic feet of dry clover will weigh a ton.

Haystacks, Covering for.—Take any coarse fabric, steep it for a few hours in a strong aqueous solution of alum, dry, and coat the upper surface with a thin covering of tar.

Headache, Remedies for.—The following recipes and suggestions for the treatment of different forms of headache are collected from a variety of trustworthy sources.

1. Two grn. citrate of caffeine, in capsule, taken every half hour, is a very effectual remedy in nervous and sick headache. One or two doses are often sufficient to give complete relief. The only objection to its use is sleeplessness, which sometimes results if it is taken in the evening. It is preferable to guarana, as being hardly ever rejected by the stomach.

The following, according to Dr. W. W. Carpenter, is very effectual in most forms of headache:

2. Muriate of ammonia, 3 drm.; acetate of morphia, 1 grn.; citrate of caffeine, 30 grn.; aromatic spirits of ammonia, 1 drm.; elixir of guarana, 4 oz.; rose water, 4 oz. Mix. Dessertspoonful every ten or twelve minutes.

3. In nervous headaches, Dr. W. A. Hammond states the value of various drugs as follows:

Oxide of zinc is of great value. Ordinary dose, 2 grn. three times a day, after meals; maximum dose, 5 grn. It is best given in form of pills.

4. Nux vomica is preferable to strychnia. The dose is ¼ grn. after meals. If the patient be chlorotic, it is well to combine a grain of reduced iron and ½ grn. sulphate of quinine.

5. Bismuth, in the form of subcarbonate, will often take the place of oxide of zinc. Dose, 2 grn. after each meal. Bismuth probably aids digestion more than any mineral tonic, and is of use when there is gastric disturbance.

6. The bromines are serviceable when the nervous system has been irritated; when it is exhausted, they do harm.

7. Phosphorus is very useful in most forms of nervous headache. The best results are obtained from dilute phosphoric acid, in doses of 30 drops, largely diluted, three times a day, after eating, or phosphide of zinc, 0·10 grn., in pill, three times a day.

8. Arsenic, as a nerve tonic, stands next in value to zinc. Dose, 5 drops Fowler's solution three times a day, after meals.

9. Galvanism is sometimes valuable, but by no means a specific. The constant current should always be used, being careful to avoid too great intensity, lest amaurosis be produced.

10. Dr. T. Lauder Brunton, editor of the London *Practitioner*, says: The administration of a brisk purgative, or small doses of Epsom salts, three times a day, is a most effectual remedy for frontal headache when associated with constipation; but if the bowels be regular, the morbid processes on which it depends seem to be checked, and the headache removed even more effectually by nitro-muriatic acid diluted, 10 drops, in a wine glass of water, or bicarb. soda, 10 grn., in water, before meals. If the headache be immediately above the eyebrows, the acid is best; but if it be a little higher up, just where the hair begins, the soda appears to be the most effectual. At the same time the headache is removed, the feeling of sleepiness and weariness, which frequently leads the patients to complain that they rise up more tired than they lie down, generally disappears."

11. A writer to the London *Lancet* remarks: "At the Middlesex Hospital female patients who have suffered many years from sick headache, evidently of a hereditary character, have been greatly benefited, if not cured, by the administration of 10 minim doses of tincture of Indian hemp, three times daily before the attacks. This is well worthy of trial in those cases of ever-living, never-dying martyrdom-like suffering."—*Hospital Gazette.*

Headache, Essences for. See **Essences.**

Headache, Nervous.—Dr. A. L. Hodgdon, of Virginia, recommends the following:

Alcohol dilut	4 oz.
Olei cinnamon	4 min.
Potas. bromid	5 drm.
Extr. hyoscyam. fl	1½ drm.
Fiat lotio.	

S. One to two teaspoonfuls, if required.

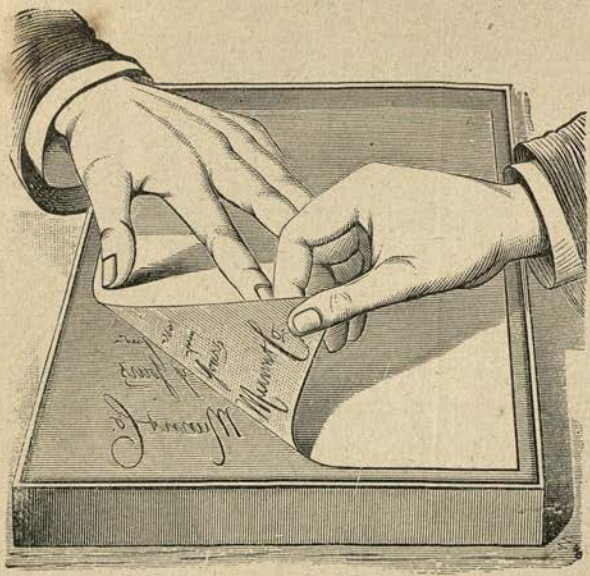
It is not disagreeable to take and has no bad effects.

Headache Liquor.—Ammonia, 4 oz.; camphor, 2 oz.; oil of anise, 1 oz.; alcohol, 1 lb. Dissolve the camphor and oil of anise in the alcohol and then add the ammonia. Rub on the head.

Heevenoid.—A rubber composition composed of caoutchouc and camphor equal parts, to which a small proportion of lime and sulphur are added, or glycerine may be substituted for the lime. It was patented by H. Gerner, of New York.

Hektograph.—1. The hektograph, or copying pad, is very useful in copying writing or drawings when only a limited number of copies is required. A practical hektograph may be prepared according to the following directions:

Soak an ounce of Cooper's gelatine overnight in enough cold water to cover it well, taking care that all the gelatine is swelled. Prepare a salt water bath by dissolving 2 oz. of common salt in 1 pt. of water. Heat 6 or 7 oz. of pure glycerine over the salt water bath to a temperature of 200° Fah. Pour off from the gelatine all the water remaining unabsorbed and add the gelatine to the hot glycerine. Continue the heating for an hour, carefully stirring the mixture occasionally, avoiding as much as possible the formation of bubbles or froth. Finally add 20 drops of oil of cloves to prevent decomposition. The composition is now ready for pouring into the vessel designed to hold it while in use. This vessel may be made especially for the purpose, or a shallow cake tin may be used. After the tin is filled with the composition it must be placed in a level posi-



HEKTOGRAPH.

tion, in a cool place, free from dust, and allowed to remain for at least five hours.

To prepare the pad for use it is necessary to pass a wet sponge lightly over the face of the gelatine and allow it to nearly dry before taking the first copy. If this precaution is neglected the face of the pad will be ruined by the first transfer.

The writing or drawing to be copied must be made with hektograph ink, using a new steel pen. (For ink, see Inks, Hektograph.) After the writing becomes dry it is placed face down on the pad and rubbed gently on the back to insure the perfect contact of every part. After remaining on the pad for about a minute remove the original and proceed to take the copies by placing the paper on the pad and removing it therefrom, always beginning at the corner, as shown in the engraving.

After taking the desired number of copies or when the impression is exhausted, the pad is to be washed lightly with a sponge wet in cold water. The pad is then allowed to dry before being used again. The washing is unnecessary when the pad is left unused for two or three days, as the ink will be absorbed so as not to interfere with making a new transfer.

The pad unavoidably wastes away in use. If its surface should become uneven or should it be injured in any way, it can be restored by reheating it over the salt water bath and allowing it to cool as before described.

Failure in making the hektograph results from either of the following causes: Inattention to the instructions; insufficient heating of the composition; the use of too much glycerine, which prevents gelatinization. The obvious remedy for the last difficulty is to use less glycerine or more gelatine.

No. 2 (kaolin formula) is recommended, as the composition gelatinizes quickly.

2. The following is a composition by Lebacque:

Gelatine	0 parts.
Water	parts.
Glycerine	375 parts.
Kaolin	50 parts.

3. Also one by W. Wartha:

Gelatine	100 parts.
Dextrine	100 parts.
Glycerine	1,000 parts.
Barium sulphate	q. s.

4. Good ordinary glue | 100 parts. |
Glycerine	50 parts.
Barium sulphate (finely powdered.)	25 parts.
Water	375 parts.

5. French Ministry of Public Works:

Glue	100 parts
Glycerine	500 parts
Finely powdered kaolin or baric sulphate	25 parts
Water	375 parts

For ink a concentrated solution of Paris violet is recommended.

To remove old copy from pad, a little muriatic acid is added to the water.

6. For a tin dish 7 × 11 in.:

Glue	3 oz.
Glycerine	15 oz.
Kaolin	¾ oz.
Water	11¼ oz.
	30 oz.

7. Hektograph Sheets.—Soak 4 parts of best white glue in a mixture of 5 parts of water and 3 parts of solution of ammonia, until the glue is soft. Warm the mixture until the glue is dissolved and add 3 parts of granulated sugar and 8 parts of glycerine, stirring well and letting come to the boiling point. While hot, paint it upon white blotting paper with a broad copying brush, until the paper is thoroughly soaked and a thin coating remains on the surface. Allow it to dry for two or three days, and it is then ready for use. An aniline ink should be used for writing, and before transferring to the blotting paper, wet the latter with a damped sponge and allow it to stand one or two minutes. Then proceed to make copies in the ordinary way. If the sheets are laid aside for two days, the old writing sinks in and does not require to be washed off.—*Chem. and Drug.*

8. Hektograph, Composition for.—Soak 2 parts best glue or gelatine in cold water overnight. Pour off the excess of water. Warm the glue in a water bath and add 20 to 24 parts of glycerine, 8 to 12 parts finely ground heavy spar or barytes, 2 parts dextrine. Mix thoroughly, stirring constantly. Pour the melted mixture in a shallow pan and allow it to cool. Less glycerine should be used in warm weather.

Hektograph Ink. See **Inks.**

Heterogeneous Metal. See **Alloys.**

Hides.—*Buffalo Hides, to Soften.*—Apply cod oil or dubbing, either of which can be obtained at a currier's shop. See also **Tanning.**

Hides, Carbolic Acid used to Preserve.—An immersion of hides for twenty-four hours in a two per cent. solution of carbolic acid, and subsequently drying them, has been successfully substituted for process of salting.

Depilating Hides, Process for.—Make a dilute solution of ammonia and sulphurous acid and place the hides in it. Coat wooly hides on the flesh side with a paste made of potter's clay and the above solution. The salts of ammonia may be used.

Honey, *Artificial.*—1. Five lb. white sugar, 2 lb. water; gradually bring to a boil and skim well. When cool add 1 lb. bees' honey and 4 drops peppermint. To make of better quality add less water and more real honey.

2. Soft water, 6 lb.; pure best honey, 3 lb.; white moist sugar, 20 lb.; cream of tartar, 80 grn.; essence of roses, 24 drops. Mix the above in a brass kettle, boil over a charcoal fire five minutes, take it off, add the whites of two eggs well beaten; when almost cold, add 2 lb. more honey. A decoction of slippery elm will improve the honey if it be added while cooling, but it will ferment in warm weather and rise to the surface.

3. Take 15 lb. Havana sugar, 6 lb. water, 60 grn. cream tartar, 15 drops essence of peppermint, 4½ lb. honey; dissolve the sugar in the water over a moderate fire, take off the scum; dissolve the cream tartar in a little warm water, add, stirring; then add the honey heated to the boiling point, then the essence of peppermint. Stir a few minutes, let it cool.

Honey, Clarified.—Refined Honey, Strained Honey.—Clarified honey is less agreeable than raw honey, but it is less liable to ferment. On the large scale one or other of the following plans is adopted:

1. The honey is mixed with an equal weight of water and allowed to boil up five or six times without skimming; it is then removed from the fire, and after been cooled, brought on several strong linen strainers stretched horizontally and covered with a layer of clean and well washed sand, an inch in depth; the sand is rinsed with a little cold water and the mixed liquor is finally evaporated to the thickness of sirup.

2. Dissolve the honey in water as last, clarify with white of egg and evaporate to a proper consistence.

3. Dissolve in water, add 1½ lb. of animal charcoal to every ¼ cwt. of honey, gently simmer for fifteen minutes, add a little chalk to saturate excess of acid, if required, strain or clarify and evaporate.

4. Honey, 1 cwt.; water, 9 gal.; fresh burned animal charcoal, 7 lb.; simmer for 15 minutes, add a little chalk to saturate free acid (if required), strain or clarify, and evaporate as before.

5. To every 14 lb. of honey add ¾ lb. animal charcoal; simmer gently for fifteen minutes, add a little chalk to saturate excess of acid. Strain and evaporate.

Honey, Method of Purifying (Vogel).—Beat 5 lb. of honey with the white of one egg till it froths, add water until the mixture is of the consistency of sirup. Next boil until the white of egg can be skimmed off. Pour into a vessel which has a faucet near the bottom; let it settle for some weeks, then draw off the pure honey.

Honeys. See **Cosmetics.**

Honey Water. See **Waters.**

Hop Beer. See **Beers.**

Hops and Hop Stalks.—In Sweden a strong cloth is manufactured from hop stalks. The stalks are gathered in autumn and soaked in water during the whole winter. The material is then dried in an oven and woven as flax. The buds of hops can be used as an esculent, and when boiled will do as a substitute for asparagus. The tendrils, when young, may be used in the same way.—*American Artisan, 1875.*

Hops, Tincture of.—Tincture of hops is made by taking 5 troy oz. hops in powder, and a sufficient quantity of diluted alcohol. Moisten the powder with 2 oz. of the alcohol, pack in a cylindrical percolator, and pour diluted alcohol on till 2 pints tincture are obtained.

Horn, to Dye. See **Dyeing.**

Horns, to Polish. See **Polishing.**

Horn, to Stain. See **Staining.**

Horn.—*Welding Horn.*—Pieces of horn may be joined by heating the edges until they are quite soft, and pressing them together until they are cold.

Softening Horn.—The bony core of the horn is first removed, the next process is to cut off with a saw the tip of the horn—that is, the whole of its solid part, which is used by the cutlers for knife handles and sundry other purposes. The remainder of the horn is left entire, or is sawn across into lengths, according to the use to which it is destined. Next it is immersed in boiling water for half an hour, by which it is softened, and while hot is held in the flame of a coal or wood fire; taking care to bring the inside as well as the outside of the horn, if from an old animal, in contact with the blaze. It is kept here till it acquires the temperature of molten lead or thereabout, and in consequence becomes very soft. In this state it is slit lengthwise by a strong pointed knife like a pruning knife, and by means of two pairs of pincers, applied one to each edge of the slit, the cylinder is opened nearly flat. The degree of compression is regulated by the use to which the horn is afterward to be put. When it is intended for leaves of lanterns, the pressure is to be sufficiently strong (in the language of the workmen) to break the grain, by which is meant separating in a slight degree the laminæ of which it is composed, so as to allow the round pointed knife to be introduced between them, in order to effect a complete separation. For combs the plates of horn should be pressed as little as possible, so that the teeth may not split at the points. They are shaped chiefly by means of rasps and scrapers of various forms, after having been roughed out by a hatchet or saw; the teeth are cut by a double saw fixed in a back, the two plates being set to different depths, so that the first cuts the teeth only half way down, and is followed by the other, which cuts the whole length; the teeth are then finished and pointed by triangular rasps. Horn for knife handles is sawn into blanks, slit, pared, and partially shaped; then heated in water and pressed between dies. It is afterward scraped, buffed, and polished.

Horns, Buffalo.—To Color the Brown Streaks Black on Buffalo Horns, after they have been Polished.—Apply a dilute solution of nitrate of silver with a brush or rag several times, until the desired intensity is obtained. Allow it after each application to dry in the sun perfectly before applying the next coat. Polish when sufficiently black.

Horse Power, very Rough Way of Estimating.—The power of a steam engine is calculated by *multiplying* together the area of the piston in inches, the mean steam pressure in lb. per square inch, the length of stroke in feet, and the number of strokes per minute, and dividing the product by 33,000.

Horse Power of Steam Engines.—Multiply the square of the diameter of the cylinder in inches by 0·7854, and this product by the mean engine pressure, and the last product by the piston travel in feet per minute. Divide the last product by 33,000 for the indicated horse power. In the absence of logarithmic formulæ or expansion table, multiply the boiler pressure for ⅝ cut off by 0·91—for ½ cut off by 0·85, ⅜ cut off by 0·75, 3-10 cut off by 0·68. This will give the mean engine pressure per square inch near enough for ordinary practice, for steam pressures between 60 and 100 lb., always remembering that the piston travel is twice the stroke multiplied by the number of revolutions per minute.

Horseradish, to Bottle.—Six tablespoonfuls scraped or grated horseradish, 1 tablespoonful white sugar, 1 qt. vinegar. Scald the vinegar; pour boiling hot over the horseradish. Steep a week, strain, and bottle. Exposure to the air will discolor.

Hostetter's Bitters. See **Bitters.**

Huile Liquereusé, etc. See **Liquors.**

Hungary Water. See **Waters.**

Hunyadi Water. See **Waters.**

Hydraulic Cement. See **Cements.**

Hydrochinon Developer. See **Photography.**

Hydrogen.—By treatment of iron or zinc scrap with dilute sulphuric acid. This is the usual way on a small scale. On the larger scale it may be made by passing steam over red hot iron scrap.

Hydrographic Paper. See **Paper.**

Hydroxides.—Many oxides, both basic and acid, are acted upon by water, frequently producing much heat, uniting with great energy. These compounds are called hydroxides, and contain hydrogen and oxygen, the elements without existing as water, as KOH.

Hydroxylamine Developer. See **Photography.**

Hypo, Test for. See **Photography.**

Hypophosphites, Fellows' Sirup of the.

Soluble phosphate or pyrophosphate of iron (U. S. P.)	15 grn.
Hypophosphite of sodium	45 grn.
Sulphate of quinine	5 grn.
Strychnine, previously dissolved.	½ grn.
Hypophosphite or sulphate of manganese	15 grn.
Thick sirup	16 oz.

Dissolve the salts by gentle heat, but without acid.

Ice, Camphor. See **Camphor Ice.**

Ice Cream.—*Almond or Oryeat Ice Cream.*—One qt. cream, 8 oz. sweet almonds, 2 oz. bitter almonds, 12 oz. sugar, 2 oz. orange flower water; blanch the almonds and pound quite fine in a mortar, using the orange flower water to prevent their oiling; rub through a sieve and pound again the portion which has not passed through until fine enough; mix with the cream and make into a custard with 7 yelks of eggs; strain, and when cold freeze.

Apple Water Ice.—Pare and core some fine apples, cut in pieces into a preserving pan with sufficient water for them to float, boil until reduced to a marmalade, strain, to 1 pt. apple water add ½ pt. sirup, juice of a lemon and a little water; when cold freeze.

Apricot (Fresh Fruit).—1. 24 fine ripe apricots, 1 qt. cream, 12 oz. sugar, the juice of 2 lemons, with a few of the kernels blanched; mash the apricots, rub through a sieve, mix and freeze.

2. From Jam.—12 oz. jam, 1 qt. cream, the juice of 2 lemons, 8 oz. sugar, a few kernels or bitter almonds blanched and pounded fine; rub the whole through a sieve and freeze.

Apricot Water Ice.—18 or 20 fine ripe apricots, ½ pt. sirup, ½ pt. water, juice of 2 lemons; mash the apricots, pass through a sieve, mix the pulp with the sirup, water and lemon juice, break the stones, blanch the kernels, pound fine with a little water, pass through a sieve, add to the mixture and freeze.

Barberry.—Same proportions as currants. Soften fresh barberries by boiling in the sirup you intend to use, or put in a stewpan and stir over the fire until tender; pass through a sieve, mix and freeze as raspberry. Barberries require no lemon juice.

Biscuit Cream.—Crumble some Savoy biscuits and a few ratafias, add the rind of two lemons rubbed on sugar, and mix with the cream when frozen.

Brown Bread Ice.—Make 1 qt. custard for ice, crumble a piece of brown bread quite fine, put on a tin and dry just inside the mouth of the oven or in a very hot stove; freeze the cream; and when the bread is cold, work or stir it in.

Burnt Almond Ice Cream.—As filbert (2).

Burnt Ice Cream.—To 1 qt. custard for ice put into a stewpan 4 oz. powdered sugar; place by the side of the stove, or over the fire to melt and burn fine brown, stirring constantly; when the proper color, mix the custard quickly with it; when cold, freeze.

Cherry Ice Cream.—2 lb. cherries, 1 qt. cream, 12 oz. sugar or sirup; pound the cherries, with the stones, in a mortar, adding a few ripe gooseberries or currants, pass the pulp through a sieve, add the cream and sugar, juice of two lemons and a little cochineal; mix and freeze. From preserved fruit it is made the same way, adding a little noyau, or a few bitter almonds pounded for the flavor of the kernel.

Cherry Water Ice.—2 lb. cherries, 4 oz. ripe gooseberries, 1 pt. sirup, ½ pt. water, good color and without any lumps in it. Those containing too much sirup cannot be frozen to the degree required, and those with too little freeze hard, and feel short and crisp like compressed or frozen snow, which arises from having too many watery particles, by the excess of water or milk. It may be ascertained when freezing commences, by the first coat which is formed round the sides. It should then be altered by either adding more cream or water, with juice or pulp of fruit, or other flavoring matter, in proportion, as the case may be, if too rich, and vice versa, by the addition of more sirup, etc., when poor; but at all times the necessity of altering should be avoided, as the component parts cannot be so perfectly blended without considerable extra labor, as if they were properly mixed at the commencement. During the freezing, or after the creams are moulded and set up, if there is too much water in the pail, the frigorific power is lessened; a little increases it, as at first it is only a solution of the salt; but as the ice dissolves and mixes with it, it decreases; therefore, when it comes to the top, drain the water off and fill up with fresh salt and ice. When the ices are properly frozen take out the pots, drain off the water, empty the pail; again replace and fill with fresh salt and ice as before, spread the creams over the sides of the pot, when they are ready for use, if intended to be served in a shop or by glassfuls. For moulds line the bottom with a piece of paper before you put it on; if there is no impression or figure on the top, you may cover that also with paper; in filling press well in, so as to fill every part; leave a little projecting above the surface to form the top, which you put on; pack the moulds in a pail, and fill the vacancies with pounded ice well mixed with plenty of salt; strew a handful also on the top. Ices should be moulded ½ to 1 hour before they are served. To turn them out, wash the mould well in cold water, that no salt may remain on; take off the bottom and top and the ice will come out freely.

Custard for Ices.—1 qt. cream, 6 eggs, 12 oz. powdered loaf sugar, break the eggs into a stewpan and whisk together; add the cream and sugar; when well mixed, place on the fire and continue stirring from the bottom with the whisk, to prevent burning, until it gets thick; take from the fire, continue to stir for a few minutes and pass through a sieve. If the custard be suffered to boil it will curdle.

Custard Ices.—These resemble cream ices, with the addition of 6 eggs to each qt. of cream, or 8 if part milk is used. All kinds of nuts, liqueurs, essences, infusions or biscuits are principally mixed with it.

Orange Water Ice.—One pt. China orange juice, 1 pt. sirup, ½ pt. water, juice of 4 large lemons. Rub the yellow rind of 4 oranges and 2 lemons on sugar, scrape off, and mix with the strained juice, sirup and water.

Peach.—As apricot.

Peach Water Ice.—One lb. pulp of ripe peaches, ½ pt. sirup, ½ pt. water, juice of 2 lemons. Mix as apricot. If the fruit is not ripe enough to pulp, open and take out the stones, put in a

stewpan with the sirup and water, boil until tender, and pass through a sieve; mix in the pounded kernels; when cold, freeze.

Pear Water Ice.—As apple.

Pineapple.—1. Fresh fruit—1 lb. fresh pineapple, ½ pt. sirup in which a pine has been preserved, 2 or 3 slices pineapple cut in small dice, juice of 3 lemons; pound or grate the pineapple, pass through a sieve, mix with 1 qt. cream, and freeze.

2. Preserved fruit—8 oz. preserved pineapple, 1 qt. cream, juice of 3 lemons, sufficient pine sirup to sweeten it; pound the preserved pine, mix lemons with the cream, and freeze.

Pineapple Water Ice.—1. Half pt. pine sirup, 1 pt. water, juice of 2 lemons, 3 or 4 slices preserved pine cut into small dice; mix and freeze.

2. Fresh—1 lb. pineapple, 1 pt. sirup, ½ pt. water, juice of 2 lemons. Cut the pine in pieces, put into a stewpan with the sirup and water, and boil until tender; pass through a sieve, add the lemon juice with 2 or 3 slices of the pine cut in small dice; mix, and when cold, freeze.

Pistachio Ice Cream.—One qt. cream, 8 oz. pistachios, 12 oz. sugar; blanch and pound the pistachios with a little of the cream; mix and finish as orgeat, flavoring with essence of cedrat, or the rind of a fresh citron rubbed on sugar; or the custard may be flavored by boiling in it a little cinnamon and mace and the rind of a lemon; color with spinach.

Punch Water Ice.—Make a good lemon ice, or use some orange juice with the lemons, in the proportion of 1 orange to 2 lemons; either rub off the yellow rind of the lemons on sugar or pare it very thin, and soak it in the spirit for a few hours; when the ice is beginning to set, work in the whites of 3 eggs to each qt., beaten to a strong froth, and mixed with sugar as for meringue, or add the whites without whisking. When nearly frozen, take the pot from the ice, and mix well with it some rum and brandy (the prevailing flavor distinguishes it as rum punch or brandy punch ice); after the spirit is well mixed, replace the pot and finish freezing. Champagne, arrack, or tea may be added.

Raspberry.—1. Fresh fruit—1 qt. raspberries, 1 qt. cream, ¾ to 1 lb. sugar; a few ripe currants and gooseberries or cherries may be added, instead of all raspberries, and the juice of two lemons; mash the fruit, pass through a sieve to take out skins and seeds, mix with the other articles, add a little prepared cochineal to heighten the color, put it in the pot, and freeze. All ices made with red fruit require this addition of cochineal.

2. Jam—1 lb. jam, 1 qt. cream, about 6 oz. sugar or sirup, and the juice of 2 lemons. Mix as before.

Raspberry Water Ice.—One qt. ripe raspberries, 4 oz. ripe cherries and currants, ½ pt. sirup, ½ pt. water, juice of 2 lemons. Mash the fruit, pass the juice through a sieve, mix the sirup, water and lemon with it, and freeze.

Ratafia Cream.—One qt. cream, as for *brown bread.* 6 or 8 oz. ratafia cakes crumbled quite fine, mix with the cream when frozen.

Roman Punch Ice.—Make 1 qt. lemon ice, and flavor with rum, brandy, champagne, and Maraschino; when frozen, to each quart take the whites of 3 eggs, and whip to a very strong froth; boil ½ lb. sugar to the ball, and rub it with a spoon or spatula against the sides to grain it; when it turns white, mix quickly with the white of egg, stir lightly together, when cold add to the ice; mix well together, and serve in glasses; less sugar must be used in the ice, so as to allow for that which is used in making the meringue.

Damson Ice.—1. 1 qt. damsons, 1 pt. sirup, ½ pt. water. Mix as peach ice. Magnum bonums, Orleans, greengages, or any other plum may be done in the same way.

Filbert Ice Cream.—1 qt. cream, 1 lb. nuts, 12 oz. sugar or 1 pt. sirup; break the nuts, roast the kernels in the oven; pound with a little cream, make a custard, and finish as almond ice. 2. Burnt. Same proportions; put the kernels into the sirup, boil until they crack; stir the sugar with a spatula, that it may grain and adhere to the nuts; when cold, pound with the sugar quite fine; make a custard and mix them with it, allowing for the sugar that is used for the nuts; mix and freeze as the others.

Ginger.—Six oz. preserved ginger, 1 qt. cream, ½ pt. of the sirup from the ginger, sufficient sugar to sweeten with, juice of 2 lemons; pound the ginger in a mortar, add the cream and freeze.

Gooseberry Water Ice.—Two lb. ripe gooseberries (red hairy sort), 1 lb. cherries, 1 pt. sirup, 1 pt. water, juice of 2 lemons; mash the fruit, pass through a sieve, mix with the sirup and water, and freeze.

Lemon Ice Cream.—Six large lemons, 1 qt. cream, and 12 oz. sugar, or ½ pt. sirup; grate the peels of 3 lemons into a basin, squeeze the juice to it, let stand for 2 or 3 hours, strain, add the cream and sirup, and freeze or mix as orange.

Lemon Water Ice.—Half pt. lemon juice, ½ pt. water, 1 pt. sirup, peels of 4 lemons rubbed on sugar (or the yellow rind pared or grated off, and the juice squeezed to it in a basin), let remain for an hour or two, strain, mix, and freeze; whip the whites of 3 eggs to a strong froth, with a little sugar, as for meringues; when the ice is beginning to set, work well in; freeze to required consistence; if to be served in glasses, the meringue may be added after it has been frozen.

Liqueur Cream Ice.—1. As noyau, flavor with the different liqueurs from which each is named. 2. Put 1 qt. cream into the ice pot with 6 oz. sugar, which place in the ice; work well about the sides with a whisk for about 5 minutes; add a glassful of liqueur, work together; whisk the whites of 2 eggs to a strong froth, add 2 oz. sugar, mix well with the cream and freeze to the required consistence.

Liqueur Water Ice.—Lemon ice, using less water, and making up the deficiency with liqueur; if the taste of the lemon prevails too much, add more water and sirup to correct.

Mille Fruit Ice Cream.—Flavor a lemon cream ice with elder flowers, mix in some preserved dried fruits and peels cut in small pieces. Before it is moulded, sprinkle with prepared cochineal, and mix a little, that it may appear marbled.

Mille Fruit Water Ice.—Make a good lemon ice, with 1 pt. sirup, ½ pt. water, and as much strained lemon juice as will give the desired flavor, with some elder flowers infused in sirup; when frozen, add some preserved green fruits and peels cut into small dice; sprinkle with prepared cochineal, and mix in a little to give a veined appearance.

Noyau Cream Ice.—Custard cream, and flavor with noyau; finish as almond ice.

Orange Ice Cream.—1. Six Seville oranges, 3 lemons, 1 qt. cream, 12 oz. sugar or sirup; rub the yellow rind of 2 or 3 of the oranges on part of the sugar, scrape off with a knife, squeeze out the juice of the oranges and lemons, and strain; mix with the cream and the sugar on which the rind was rubbed, add the other part of the sugar, dissolve, and freeze. 2. 8 China oranges, 2 lemons, 1 qt. cream, 12 oz. sugar; rub the rind of 4 or 5 of the oranges and 1 lemon on sugar, squeeze, strain the juice; add the cream, mix, and freeze.—*W. R.*

Vanilla Ice Cream.—Cream, 2 qts.; sugar, 1½ lb.; yelks of 1 dozen eggs; the whites of 2 eggs; vanilla bean, or stick, a sufficient *quantity*, say ½ of a bean grated very fine; *lemon peel*, a small piece. The liquid flavoring may be used, but the product is not as fine as the Delmonico made by using the bean.

Strawberry.—As raspberry.

Strawberry Water Ice.—Two bottles best scarlet pines, 1 pt. sirup, ½ pt. water, juice of 2

lemons. Mix as currant. All red fruits require a little prepared cochineal to heighten the color.

Swiss Pudding.—Take 1½ pt. cream and ½ pt. milk and make into a custard with 7 yelks of eggs; flavor with curaçoa, Maraschino, or rum; freeze the custard and add about ¼ lb. dried cherries, orange, lemon and citron peel and currants; mix in the iced custard. The curaçoa or rum may be poured over the fruit when you commence freezing or before. Prepare the mould, which is melon shaped, opening in the center with a hinge. Strew over the inside with clean currants, fill and close; immerse in some fresh ice mixed with salt. Before turning out, prepare a dish as follows: Make a little custard and flavor with brandy; dissolve some isinglass in water or milk, and when nearly cold add sufficient to the custard to set it; pour into the dish you intend to serve on. As soon as set, turn the pudding on it and serve.

Tea Ice.—1 qt. cream, 2 oz. best green tea, 12 oz. sugar; put the tea into a cup, pour on a little cold river water in which has been dissolved a portion of carbonate of soda (about as much as may be placed on a ten cent piece), let remain for an hour or two, add boiling water sufficient to make a very strong infusion; or cold water in proportion, letting it soak longer, when a superior infusion will be obtained; strain and add to the cream and eggs. Finish as the others.

Vanilla Ice.—One qt. cream, ½ oz. vanilla, 12 oz. sugar; cut the vanilla into small pieces and pound with the sugar until quite fine; add to cream and eggs, make into a custard, strain and when cold freeze.

Ice, to Store.—1. Build a round brick well, with a small grating for drain at bottom for the escape of water from melted ice. Cover the bottom with a thick layer of good wheat straw. Pack the ice in layers of ice and straw. Fix a wooden cover to the well.

2. Fire-brick, from its feeble conducting power, is the best material to line an ice house with. The house is generally made circular and larger at the top than the bottom, where a drain should be provided to run off any water that may accumulate. As small a surface of ice as possible should be exposed to the atmosphere; therefore each piece of ice should be dipped in water before stowing away, which, by the subsequent freezing of the pieces into one mass, will remain unmelted for a long time.

3. A very cheap way of storing ice has been described by Pearson of Kinlet. The ice stack is made on sloping ground close to the pond whence the ice is derived. The ice is beaten small, well rammed, and gradually worked up into a cone or mound 15 ft. high, with a base of 27 ft., and protected by a compact covering of fern 3 ft. thick. A dry situation and sloping surface are essential with this plan and a small ditch should surround the heap, to carry rapidly away any water that may come from melted ice or other sources.

4. Put the ice on a dish and cover it with a napkin, then set the dish upon a feather bed or pillow, and place another bed or pillow on the top of it. In this way a few lbs. of ice may be kept for a week or more. Wrap the ice in a piece of old flannel, and if not required immediately bury it in the ground.

Ice, Strength of.—

Ice 2 in. thick will bear infantry.
Ice 4 in. thick will bear cavalry or light guns
Ice 6 in. thick will bear heavy field guns.
Ice 8 in. thick will bear 24-pounder guns on sledges; weight not over 1000 lb. to a square foot.

Iceland Moss.—A lichen that grows in exposed places in Iceland. Its use in the arts is limited.

Iceland Moss, Saccharatea.—Iceland Moss, 1 lb.; refined sugar, 1 lb.; macerate the moss in water to extract the bitterness, express, boil in water for an hour, strain, let settle, decant, add the sugar, evaporate to dryness with a gentle heat, constantly stirring, and finally reduce to powder.

Imperial.—*Syn.* Imperial Drink.—1. Cream of tartar, ½ oz.; fresh orange or lemon peel, 3 oz.; lump sugar, 4 oz.; boiling water, 3 pts.; digest in a close vessel until cold, then pour off the clear.

2. (Collier). To the last add cream of tartar, ½ oz., and sweeten to palate. Refrigerant; a common drink in fevers and in hot weather.

Impressions, Metal, for Taking. See **Alloys.**

Impression.—A very good impression of any article of metal having a flat ornamented surface may be taken by wetting some note paper with the tongue, and smoking it over a gas flame. The article is then pressed upon the smoked part, when, if the operation be carefully conducted, a clear impression will appear. This *can* be made permanent by drawing the paper through milk, and afterward drying it.

Incense. See **Pastils.**

Incense Powders. See **Pastils.**

Incineration.—The reduction of organic substances to ashes. An example of this is the manufacture of charcoal, ivory black, etc.

Incrustation of Boilers.—*Remedies for.* Remedies that have been adopted with more or less success for boiler incrustation:

1. Potatoes, ⅛ weight of water, prevent adherence of scale.
2. Twelve parts salt, 2½ caustic soda, ⅛ extract of oak bark, ½ of potash.
3. Pieces of oak wood suspended in boiler and renewed monthly, prevent deposit.
4. Two oz. muriate of ammonia in boiler twice a week prevents incrustation and decomposes scale.
5. Coating of 3 parts black lead, 18 tallow, applied hot to the inside of a boiler every few weeks, prevents scale.
6. Thirteen lb. molasses fed occasionally into an 8-horse boiler prevented incrustation for six months.
7. Mahogany or oak sawdust in limited quantities. The tannic acid attacks the iron, and should therefore be used with caution.
8. Slippery elm bark has been used with some success.
9. Carbonate of soda.
10. Chloride of tin.
11. Spent tanners' bark.
12. Frequent blowing off.
13. Paraffin oil has been used with excellent results in locomotive boilers.
14. Marine boilers are sometimes protected from corrosion by a very thin wash of Portland cement inside.—*Mechanics' Magazine.*

Anti-Incrustators.—M. E. Asselin, of Paris, recommends the use of glycerine to prevent incrustation in steam boilers. It increases the solubility of combinations of lime, and especially of the sulphate. It forms with these combinations soluble compounds. When the quantity of lime becomes so great that it can no longer be dissolved, nor from soluble combinations, it is deposited in a gelatinous substance, which never adheres to the surface of the iron plates. The gelatinous substances thus formed are not carried with the steam into the cylinder of the engine. M. Asselin advises the employment of 1 lb. of glycerine for every 300 or 400 lb. of coal burnt.

Boiler Incrustation, to Prevent.—1. For a 5-horse power boiler, fed with water, which contains calcic sulphate, take: Catechu, 2 lb.; dextrine, 1 lb.; crystallized soda, 2 lb.; potash, ½ lb.; cane sugar, ½ lb.; alum, ½ lb.; gum arabic, ½ lb.

2. For a boiler of the same size, fed with water which contains lime: Turmeric, 2 lb.; dextrine, 1 lb.; sodium bicarbonate, 2 lb.; potash, ½ lb.; molasses, ½ lb., alum, ½ lb.

3. For a boiler of the same size, fed with water which contains iron: Gamboge, 2 lb.; soda, 2 lb.; dextrine, 1 lb.; potash, ½ lb.; sugar, ½ lb.; alum, ½ lb.; gum arabic, ½ lb.

4. For a boiler of the same size fed with sea water: Catechu, 2 lb.; Glauber's salt, 2 lb.; dextrine, 2 lb.; alum, ½ lb.; gum arabic, ½ lb.

When these preparations are used add 1 qt. of water, and in ordinary cases charge the boiler every month, but if the incrustation is very bad, charge every two weeks.

5. Boiler Incrustations, to Prevent.—For boilers of 100 horse power fed with river water, use the following, which should be renewed whenever the boiler is emptied: Crystallized soda, 18 lb.; dextrine, 18 lb.; alum, 6 lb.; sugar, 6 lb.; potash, 3 lb.

6. For the same sized boiler, fed with sea water: Soda, 24 lb.; dextrine, 24 lb.; sugar, 12 lb.; alum, 3 lb., potash, 3 lb.

Indelible Ink. See **Inks.**

Indelible Pencils. See **Pencils, Indelible.**

Index of a Lathe, to Obtain.—How to Obtain the Index of an Engine Lathe.—If you will note what thread the lathe will cut when two given gears are in place, you can easily construct a table that will show you just what thread any two gears will cause the lathe to cut. Suppose that two sixty-threes cause 12 threads to the inch. Then place 12 in the space A in the diagram below.

STUD.

SCREW	28	33	35	42	49	56	63	70	77	84	91	98	105	112
28														
33														
35														
42														
49					b									
56						a	C							
63						B	A	D						
70							E	c						
77									d					
84														
91														
98														
105														
112														

Now, 63 : 56 :: A : C
63 : 70 :: A : E } Direct proportion.

Also, 56 : 63 :: A : B
70 : 63 :: A : D } Inverse proportion.

The spaces may all be filled except a, b, c, d, etc., which it is useless to fill, as only your 63 gear is duplicated. A half day's time will be sufficient for a good mathmatician to fill out the table.

Indexing, a Method of.—A writer says: Having had to index twenty-nine thousand words, I think I have a right to speak about it. In the first place, I got hold of a somewhat stiffish paper (old ledger paper is excellent); then I cut it into slips of different size (one inch by two inches will be about right). I put down on each slip a word or sentence (depending on the kind of index), with page and other reference if such is necessary. When every word or sentence which I wanted in the index was noted down, I got hold of twenty-six cigar boxes, which I lettered from a to z. I now distributed those slips into the boxes. This done, I put the contents of each box in a separate paper bag, put the now empty boxes again before me, got hold of a and distributed all slips bearing words beginning with a between these boxes, thus, aa, ab, ac, ad, etc., to the end of the chapter. This done, I got hold of aa and successively ab, ac, etc., and distributed those slips further. When arranged alphabetically I pasted those slips belonging to a in proper order on brown wrapping paper. Having treated a in this way, I took hold of b, and so on to the end of the alphabet. It took me a fortnight (six hours a day) to get through with the distribution, and after that the copying took me several months.

India Ink. See **Inks.**

India Paper. See **Paper.**

India Rubber, Cement for and India Rubber Cements. See **Cements.**

India Rubber, to Preserve.—1. In the opinion of Hempel, the hardening of vulcanized India rubber is caused by the gradual evaporation of the solvent liquids contained in the India rubber, and introduced during the process of vulcanization. Guided by this notion, he has made experiments for a number of years in order to find a method for preserving the India rubber. He now finds that keeping in an atmosphere saturated with the vapors of the solvents answers the purpose. India rubber stoppers, tubing, etc., which still possess the elasticity, are to be kept in vessels containing a dish filled with common petroleum. Keeping in wooden boxes is objectionable, while keeping in airtight glass vessels alone is sufficient to preserve India rubber for a long time. Exposure to light should be avoided as much as possible. Old hard India rubber may be softened again by letting the vapor of carbon bisulphide act upon it. As soon as it has become soft, it must be removed from the carbon bisulphide atmosphere and kept in the above way. Hard stoppers are easily made fit for use again in this manner, but the elastic properties of tubing cannot well be restored.—*Ber. Chem. Ges.* 2. In order to prevent India rubber materials from hardening and cracking, they are steeped in a bath of melted paraffin for a few seconds, or several minutes, in accordance with the size of the articles, and then dried in a room heated to about 212° F. See **Rubber.**

India Rubber Varnish. See **Varnishes.**

Infusions.—In preparing infusions, as in every other process, in which the object is to dissolve out the active principles, the subject acted upon should first be brought to such a condition by bruising, grinding, etc., as to enable the solvent medium to act upon it most readily. If an infusion is desired of dried leaves or flowers, they should be moistened with a little boiling water, and time allowed for them to swell and soften before adding the rest of the water. Infusions are generally prepared by pouring boiling water on the substance and setting aside in a closed vessel until it cools; but either hot or cold water may be used according to the nature of the substance and the objects to be accomplished. The soluble principles are usually more rapidly and thoroughly extracted by hot than cold water, and when desirable the temperature may be prolonged by placing the vessel near the fire. When the principle to be extracted is highly volatile, or would be injured by heat, cold water should be used, but the process will require longer time for completion.

Indicator Diagrams, Steam Engine.—A steam engine indicator is an instrument possessing a barrel which may be revolved by the stroke of the engine, a coiled spring making the return stroke. A suitable stylus or pencil is actuated by the piston within a closed cylinder, open to the cylinder of the engine to be tested. A gauged spring is so arranged as to act by its tension against the said piston, and thereby render the movement of it proportionate to the pressure. Two dimensions are, therefore, attainable, one (Fig 1), A B, corresponding to steam pressure, and the other, B C, corresponding to the stroke. The perpendicular ordinates *a b c*, parallel to A B, are constructed *after* the diagram is taken, and represent ali-

quot parts of the stroke. The line A B is measured off by a scale, corresponding to the

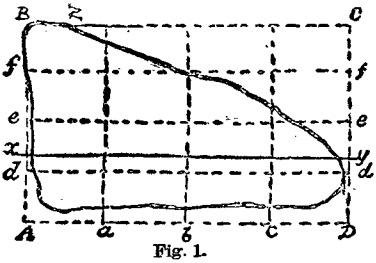


Fig. 1.

spring before referred to, and the steam pressure in lb. per sq. in. may then be read off by horizontal lines, *d e f*.

The line *x y* is called the atmospheric line, or line of no pressure (zero on the scale), and in non-condensing engines the whole of the diagram is above the line, but with condensing engines the vacuum or exhaust is shown below the line, and must be calculated from the base line. Having taken a diagram (see the figure), the length of the ordinates *a b c* must be taken from the base to where the described curve cuts them, and read off in terms of the scale.

M	= mean pressure.
AB	= 60·0
a	= 52·5
b	= 45·0
c	= 32·5
CD	= 12·0
Total	202·0

$$M = \frac{202}{5} = 40{\cdot}5 \text{ lb. per sq. in.}$$

Inhalant.

Compound tincture iodine..	180 minims.
Carbolic acid No. 1.....	48 minims.
Glycerine....	1 fl. oz.
Water.....	5 fl. oz.

Mix and expose to the sunlight until the mixture is entirely colorless. The proportion of carbolic acid and tincture of iodine may be largely increased without a corresponding addition of glycerine.

Injecting Fluids. See **Microscopy.**

Inks. — The following collection of ink recipes is very large, and only those have been selected which were believed to be trustworthy. Ink recipes are noted for their unreliability, but the following were selected principally from periodical literature, and many are translated for the first time. The manufacture of writing ink is one of the most promising of the small industries.

Writing Ink.—There are few chemical preparations the use of which has become so general as that of writing ink. And yet it is rare to find an ink that fulfills all the conditions required of it. This is explainable upon the ground that ink recipes are not constructed according to any chemical formula, but that we are compelled to rely upon empirical experiments and make use of the results gathered by practical experience. A good black ink must flow easily from the pen, and must yield either immediately or in a short time a deep black writing. It must not corrode metallic pens nor destroy the paper. Further than this, a good ink should contain no considerable sediment when kept in airtight bottles. In ordinary ink bottles a sediment will always form, and the more it is exposed to the atmosphere the faster it will form. An ink that is to be used for important documents must not be washed out with water or absolute alcohol so as to be permanently illegible.

Ink may consist of either a clear solution of any dyestuff or, as in the case of common black ink, a finely divided, insoluble precipitate suspended in water. The chief materials used for making this ink are gallnuts, green vitriol, and gum, which are employed in the most varied proportions. The gallnuts are crushed to a coarse powder and boiled in water, or, better, digested for several hours at a temperature near the boiling point, and the gum and green vitriol added to the filtered decoction in solution.

The so-called alizarine inks flow easily from the pen, but they mostly suffer from the fact that the writing appears at first only of a faint greenish, bluish, or reddish color, although it gets darker afterward.

The most permanent writing is done with India ink, because the black coloring matter of this ink consists of finely divided carbon, which is unaffected by chemical reagents. Its high price seldom premits of its use.

For ordinary use only such ink is recommended as consists either of pure galls and iron, or of some mixture in which these are the chief ingredients.

The inks for other purposes, as printing inks, are fully treated, and all are arranged alphabetically.

To Age or Develop the Color of Ink.—It has been the custom to keep ink for two or three months to develop its color; but it is stated that this may be accomplished in a few hours by forcing fine streams of air through it. This is done by having a coil of perforated pipe in the bottom of a tank containing the ink, and forcing the air through it by a pump, blower, or otherwise.

Aniline Inks.—Alcoholic Solutions.—1. General formula.—Dissolve 15 parts of aniline color in 150 parts of strong alcohol in a vessel of glass or enameled iron for three hours, then add 1,000 parts distilled water; heat gently for some hours, in fact, till the color of the alcohol has quite disappeared; then add a solution consisting of 60 parts of powdered gum arabic in 250 parts of water.

2. Special Formula for Violet.—Digest ½ oz. aniline violet in 1 oz. alcohol in a suitable vessel as above for three hours; then add 1 qt. of distilled water and heat gently till odor of spirit is dissipated. Then add 2 drm. gum arabic dissolved in ½ pt. water and allow the whole to settle. This will bear dilution, if desired, with an additional quantity of distilled water.

3. Special Formula for Blue.—Dissolve 15 gr. aniline blue in 1 oz. alcohol, and add 6 oz. in distilled water. Boil in proper vessel as above, until odor of alcohol has disappeared. Then add 3 drm. powdered gum arabic dissolved in 4 oz distilled water. Finally filter. You will perceive that there is some considerable difference in the above special formula, but there can be no harm in making it too strong, as it is no difficult matter to dilute with distilled water to taste.

4. Aqueous Solutions.—Magenta.—1 oz. to the gallon of boiling distilled water.

5. Violet.—½ oz. to 1 gal. of boiling distilled water.

6. Blue.—1 oz. to 10 pt. of boiling distilled water.

7. Green.—1 oz. to 5 pt. of boiling distilled water. The addition of a small quantity of vinegar will considerably improve the color of blue aniline fluid. These aqueous solutions are very enduring, though not exactly permanent, as they give way to long continued exposure to sunlight. They are very limpid, dry quickly and never clog. They should of course be filtered.

Autographic Ink.—

1. White soap.....	100 parts.
White wax.	100 parts.
Mutton suet.....	30 parts.
Shellac	50 parts.
Mastic	50 parts.
Lampblack.....	30 or 35 parts.

2. Use a saturated solution of alum with coloring matter in it, as indigo.

Black Inks.—1. Aniline Black Ink.—Concentrated solution of borax, 1 part; shellac, 4 parts; boil; add aniline black.—*English Mechanic.*

2. Arnold's Writing Fluid.—This writing fluid is a mixture of sulphate of indigo and ordinary ink. It flows freely from the pen and at last becomes very black.

3. Asiatic Black Ink.—Logwood shavings and powdered galls, of each 2 lb.; green vitriol, 1 lb.; gum, ½ lb.; pomegranate bark, ¼ lb.: water, 1 gal.; infuse 14 days with frequent agitation or boil.

4. Brand's Aleppo gallnuts (pulverized), 10 parts; water, 125 parts; crystallized sulphate of iron, 5 parts; gum arabic, 6¼ parts.

5. (Elsner) galls (powdered), 42 oz.; gum senegal (powdered), 15 oz.; distilled or rain water, 18 qt.; sulphate of iron (free from copper), 18 oz.; liquor of ammonia, 3 drm.; spirit of wine, 24 oz.; mix these ingredients in an open vessel, stirring frequently until the ink attains the desired blackness. This formula is said to give a deep black neutral ink that does not corrode steel pens.

6. Geisoler's.—Powder coarsely 2 lb. gallnuts, 1½ lb. iron sulphate, 7 oz. gum arabic. Add 2 qt. vinegar, 3½ gal. water. Stir the mixture frequently. Let it stand from eight to ten days, then pour off the ink.

7. Jahn's.—Bablah, 75 parts; ground logwood, 12½ paris; water, 750 parts. Boil down to half its volume. Strain through linen, add 6¼ parts sugar, 6¼ parts gun arabic; sulphate of iron (finely pulverized), 18¾ parts. To prevent moulding add a small quantity of a solution of chloride of mercury.

8. Peltz in *Pharm. Zeitschr. f. Russl.*, recommends the following for making a good ink:

	Parts.
Extract of logwood	100
Lime water	800
Carbolic acid	3
Common hydrochloric acid	25
Distilled water	600
Gum arabic	30
Bichromate of potassium	3
Distilled water enough to make	1,800

Dissolve the extract in the lime water, in a porcelain or well enameled iron vessel, over a steam bath, with frequent stirring. Add the carbolic acid and hydrochloric acids, which change the solution from a red to a brownish yellow color. After half an hour's heating over the steam bath set the mixture aside until cold, then strain or filter. Now add the bichromate of potassium and the gum, each separately dissolved in a considerable quantity of distilled water, and finally add enough water to make 1,800 parts. This ink is a fine red color, which quickly turns black. It does not corrode steel pens, and, if it dries, needs only the addition of water.

9. Shellac, 4 oz.; borax, 2 oz.; water, 1 qt.; boil till dissolved, and add 2 oz. gum arabic dissolved in a little hot water; boil and add enough of a well triturated mixture of equal parts of indigo and lampblack to produce the proper color; after standing several hours draw off and bottle.

10. An exceedingly fine ink is said to be produced by the following recipe: 11 parts galls, 2 parts green vitriol, ⅛th part indigo solution and 33 parts of water. Here the relatively larger quantity makes the gum unnecessary, while the indigo solution makes the brilliant black seem still deeper. Writing executed with this ink may, it is true, be removed by means of dilute acids, but it may be rendered visible again by chemical means.

11. Bruised Aleppo nutgalls, 2 lb.; water, 1 gal.; boil in a copper vessel for an hour, adding water to make up for that lost by evaporation; strain and again boil the galls with a gallon of water and strain; mix the liquors and add immediately 10 oz. of copperas in coarse powder and 8 oz. of gum arabic; agitate until solution of these latter is effected, add a few drops of a solution of potassium permanganate, strain through a piece of hair cloth, and after permitting it to settle bottle. The addition of a *little* extract of logwood will render the ink blacker when first written with. Half an oz. of sugar to the gal. will render it a good copying ink.

12. The *Industrie Blatter* recommends the following formula as furnishing a good and cheap writing ink: French extract of Campeachy wood, 100 parts; lime water, 800 parts; phenol (carbolic acid), 3 parts; hydrochloric acid, 25 parts; gum arabic, 30 parts; red chromate of potash, 3 parts. The extract is first dissolved in the lime water on a steam bath with frequent stirring or shaking, after which the carbolic and hydrochloric acids are added, and change the red color to a brownish yellow. It is then heated half an hour on steam bath and set aside to cool. It is next filtered, and the gum and bichromate dissolved in water, are added. Enough water is then added to make up the solution to 1,800 parts. This ink is a fine red when used, but soon gets black.

13. Black, for Shading Pens.—The following recipe is for a glossy black ink for patent shading pens:

Powdered nutgalls	18 parts.
Iron sulphate	8 parts.
Gum arabic	7 parts.
Pure water	145 parts.

The galls are first boiled in 130 parts water, the iron sulphate and gum arabic dissolved in 15 parts water, and this solution then slowly added to the former.

With Logwood.—14. A decoction of logwood is first made by boiling 10 lb. logwood in enough water to produce 80 lb. of the decoction. To 1,0 0 parts of this logwood extract when cold, is added 1 part of yellow (neutral) chromate of potash (K_2CrO_4), stirring rapidly. It is ready for use at once, without any addition; but it possesses the great fault of soon becoming thick. This may be corrected by adding corrosive sublimate or any other antiseptic. 15. Boil 10 oz. logwood in 20 oz. water; then boil again in 20 oz. more water and mix the two decoctions; add 2 oz. chrome alum, and boil again for one-quarter hour; and 1 oz. gum arabic. The product is 25 oz. deep black ink. 16. Two lb. bruised galls, digested in 2 qt. alcohol at a temperature of 104° to 140° F. (40° to 60° C.); when about half the alcohol has evaporated, add 3 qt. water; stir well and strain through a linen cloth. To clarify the solution add 8 oz. glycerine, 8 oz. gum arabic and 1 lb. sulphate of iron dissolved in water. Stir thoroughly from time to time for a few days, allow to settle and put up in well stoppered bottles for preservation. The addition of too much sulphate of iron is to be avoided, as causing the ink soon to turn yellow. Ink thus prepared is said to resist the action of light and air for at least 12 months without suffering any change of color. 17. Digest in an open vessel 42 oz. coarsely powdered galls, 15 oz. gum senegal, 18 oz. sulphate of iron, 3 drm. aqua ammoniæ, 24 oz. alcohol and 18 qt. distilled or rain water. Continue the digestion till the fluid has assumed a deep black color. 18. To good gall ink add a strong solution of fine Prussian blue in distilled water; the ink writes greenish blue, but afterward turns black; it is said that it cannot be erased either by acids or alkalies without the destruction of the paper.

19. Twenty parts by weight extract of logwood are dissolved in 200 parts water and the solution is clarified by subsidence and decantation. A yellowish brown liquid is thus obtained. In another vessel, 10 parts ammonia alum are dissolved in 20 parts boiling water; the two solutions are mixed, there being also added ½ part sulphuric acid and finally 1½ part sulphate of

copper. The ink should be exposed to the air for a few days to give it a good color, after which it should be stored in well corked bottles.

20. Thirty parts extract of logwood are dissolved in 250 parts of water; 8 parts crystallized carbonate of soda and 30 parts glycerine (sp. gr. 1·25) are added; lastly, 1 part neutral chromate of potash and 8 parts gum arabic, reduced to a powder and dissolved in water. This ink does not attack pens, does not turn mouldy and is very black.

21. Joseph Ellis, of Brighton, stated to the Society of Arts that, by making a solution of shellac with borax in water and pure lampblack, an ink is producible which is indestructible by time or by chemical agents, and which, on drying will present a polished surface, as with the ink found on the Egyptian papyri. He made such an ink, and proved, if not its identity with that of ancient Egypt, yet the correctness of the formula.

22. (Karmarsch.)-Pulverized gallnuts, 9 parts; 3½ parts gum arabic; sulphate of iron, 3½ parts; 75 parts water.

23. (Lewis.)-Two oz. pulverized iron sulphate, 2 oz. pulverized logwood, 7 oz. pulverized gallnuts, 2 oz. gum arabic, 2 qt. white wine or acetic acid.

24. Prerogative Court.—Galls, 1 lb.; gum arabic, 6 oz.; alum, 2 oz.; green vitriol, 7 oz.; kino, 3 oz.; logwood raspings, 4 oz.; soft water, 1 gal.; macerate. Said to write well on parchment.

25. (Reid.) Pulverized gallnuts, 2 lb.; sulphate of iron, ½ lb.; water, 6 qt.

26. (Ribaucourt.) Galls, 1 lb.; logwood, ½ lb.; gum, 6 oz.; sulphate of iron, ½ lb.; sulphate of copper, 2 oz.; sugar, 2 oz.; water, 12 lb. (or 5 qt.). This has the disadvantage of corroding the steel pens and the penknives with which it comes in contact.

27. Black Ruling Ink.—Add fresh gall to good black ink. Do not cork, as it prevents it from turning black.

28. Runge's Black Writing Fluid.—Digest ¼ lb. logwood in fine chips for twelve hours in 3 pt. boiling water, then simmer down gently to 1 qt., carefully avoiding dust, grease and smoke. When cold decant the decoction and dissolve in it by agitation 20 grn. yellow chromate of potash; it will then be fit for use.

29. (Van Moos.)-Gallnuts, coarsely powdered, 75 parts; sulphate of iron, 42½ parts; over this pour 2,000 parts cold water. Digest from twenty-four to forty-eight hours. Strain through a cloth and add twenty-four parts gum arabic.

30. Rich Blue Black.—Take enough elderberries to make a quantity of the liquid, bruise and put them in an earthen jar for three days, when they are to be crushed and the juice to be filtered. To every 25 pt. of the filtered liquid 1 oz. of sulphate of iron and 1 oz. of crude pyroligneous acid is added. This ink will have a violet color when used, but turns to a blue black on drying.

Blue Inks.—1. Three parts Prussian blue, 1 part oxalic acid and 30 parts of water. When dissolved add 1 part of gum arabic.

2. Beautiful Blue Writing Fluid.—Dissolve basic or soluble Prussian blue in pure water. This is the most permanent and beautiful ink known.

3. Chinese Blue Ink.—Two oz. Chinese blue, 1 qt. boiling water, 1 oz. oxalic acid; dissolve the blue in the water and add the acid; it is ready for use at once.

4. One and one-eighth oz. of the so-called bleu soluble Parisienne (soluble Paris blue, also called cornflower blue) is dissolved in alcohol.

5. Blue Writing Fluid (Mohr).—Pure Prussian blue, 9 parts; oxalic acid, 1½ part. Triturate to a smooth paste with a little water. Dilute with sufficient soft water to make it fluid.

6. Blue Ruling Ink.—Good vitriol, 6 oz.; indigo, 1½ oz.; pulverize the indigo and add to the vitriol. Expose to the air for six days, or until dissolved. Fill the pots with chalk, add ¾ gill fresh gall, boiling it before use.

7. Blue, for Ruling.—Take 4 oz. of vitriol, best quality, to 1 oz. of indigo; pulverize the indigo very fine; put the indigo on the vitriol; let them stand exposed to the air for six days, or until dissolved; then fill the pot with chalk, add ½ a gill of fresh gall, boiling it before use.

8. Stephen's Blue Black Writing Fluid.—Pure Prussian blue, 6 parts; oxalic acid, 1 part. Triturate with a little water to a perfectly smooth paste, then dilute the mass with a proper quantity of soft water.

Bookbinders' Ink.—A very good red ink may be made in the following manner: Infuse ¼ lb. of Brazil wood raspings in vinegar for two or three days. Boil the infusion gently for an hour and filter it while hot. Put it again over the fire and dissolve in it, first, ½ oz. of gum arabic and afteward of alum and white sugar, each ½ oz. A little alum will improve the color. The blue is a solution of indigo or Prussian blue.

Branding Ink.—1. Triturate together 1 part of pine soot and 2 parts of Prussian blue with a little glycerine; then add 3 parts of gum arabic and sufficient glycerine to form a suitable paste.

2. The following is recommended as a waterproof branding ink:

Shellac	2 oz.
Borax	2 oz.
Water	25 oz.
Gum arabic	2 oz.
Lampblack	q. s.

Boil the borax and shellac in water till they are dissolved and withdraw from the fire. When the solution has become cold, complete 25 oz. with water and add lampblack enough to bring the preparation to a suitable consistency. When it is to be used with a stencil it must be made thicker than when it is applied with a brush.

3. The above gives a black ink; for red ink substitute Venetian red for lampblack.

4. For blue, ultramarine.

5. And for green, a mixture of ultramarine and chrome yellow.

Red Branding Ink.—The following recipe is from the *Druggists' Circular*:

Cochineal, pulverized fine	2 oz.
Cream of tartar	2 oz.

Mix, and add—

Boiling water	8 oz.

Let stand for a quarter of an hour, then neutralize by adding—

Carbonate of potash	1 oz.

After the neutralization add—

Alum (powdered)	1 oz.
Gum arabic (powdered)	1 oz.
Starch	2 oz.

Mix.

Brown Ink.—1. By adding to the violet ink finely powdered bichromate of potash, in the proportion of from 15 to 30 grn. to 1 oz., various shades of brown and snuff color are obtained.

2. A strong decoction of catechu; the shade may be varied by the cautious addition of a little weak solution of bichromate of potash.

3. A strong decoction of logwood, with a very little bichromate of potash.

Burnishing Ink.—1. Four oz. shellac, 1 oz. borax, sufficient water. Boil to the consistence of sirup, and add a few drops of strong ammonia water. A small amount of soap is sometimes also introduced. Add a sufficient quantity of this to the ink to obtain the desired result. Instead of the above, soap is often used alone, or with a trace of glycerine, ammonia or gum arabic.

2. Receipts for burnishing ink for heel and sole edge polishing.

a. Extract of logwood..... 1 to 2 oz.
Tincture of iron..... 1 to 2 oz.
Sweet oil..... 1 to 2 drm.
Diluted alcohol..... 1 pt.

b. Extract of logwood ..... 4 oz.
Bichromate of potassium.....12 grn.
Ferrocyanide of potassium....12 grn.
Rain water.... ..... 1 gal.

The ink in either case is applied with a brush and immediately burnished with a hot iron.

Canceling Ink for Post Offices, etc.—A fine grade of printing ink is ordinarily employed. A good ink may be made as follows: Balsam of copaiba, pure, 9 oz.; lampblack, 3 oz.; indigo, 5 drm.; Prussian blue, 5 drm.; Indian red, ¾ oz.; dried yellow soap, 3 oz.; grind to a uniform smoothness.

Carbon Ink.—Genuine India ink rubbed down with good black ink until it will flow easily from a pen. This ink resists chlorine and oxalic acid.

Copying Ink.—1. The quality required of a copying ink is that it shall afford one or more copies of the written matter by applying dry or damped paper to its surface, and subjecting it to more or less pressure. The best kinds of copying ink are usually prepared by adding a little alum to an extract of logwood of 10° B., 1·075 sp. gr., or to a decoction of the same, and then, to improve its copying power, some sugar and glycerine or table salt is added. Such inks have a violet tint, are purple when first written, and gradually darken on the paper. The copies taken from them are at first very pale, and only slowly darken. The chief recipes for copying inks are the following:

2. Mix about 3 pt. jet black writing ink and 1 pt. glycerine. This, if used on glazed paper, will not dry for hours, and will yield one or two fair, neat, dry copies, by simple pressure of the hand in any good letter copy book. The writing should not be excessively fine, nor the strokes uneven or heavy. To prevent setting off, the leaves after copying should be removed by blotting paper. The copies and the originals are neater than when water is used.

3. A good copying ink may be made from common violet writing ink by the addition of 6 parts glycerine to 8 parts of the ink. Using only 5 parts of glycerine to 8 parts of the ink, the ink will copy well fifteen minutes after it has been used. With fine white copying paper, it will copy well without the use of a press.

4. Half pound extract of logwood, 2 oz, alum, 4 dr. blue vitriol (sulphate of copper), 4 dr. green vitriol, sulphate of iron, 1 oz. sugar; boil these ingredients with 4 parts water, filter the decoction through flannel; add a solution of 4 dr. neutral chromate of potash in 4 oz. water, and a solution of 2 oz. chemic blue in 2 oz, glycerine. The chemic blue is the solution of indigo in sulphuric acid, or sulphindigotic acid.

5. A black copying ink which flows easily from the pen, and will give very sharp copies without the aid of a press, can be prepared thus: 1 oz. coarsely broken extract of logwood and 2 dr. crystallized carbonate of soda are placed in a porcelain capsule with 8 oz. distilled water, and heated until the solution is of a deep red color, and all the extract is dissolved. The capsule is then taken from the fire. Stir well into the mixture 1 oz. glycerine, sp. gr. 1·25, 15 gr. neutral chromate of potash, dissolved in a little water, and 2 dr. finely pulverized gum arabic, which may be previously dissolved in a little hot water so as to produce a mucilaginous solution. The ink is now complete and ready for use.

6. Bruised Aleppo nutgalls, 2 lb.; water, 1 gal.; boil in a copper vessel for an hour, adding water to make up for that lost by evaporation; strain and again boil the galls with 1 gal. water and strain; mix the liquors and add immediately 10 oz. copperas in coarse powder and 8 oz. gum arabic; agitate until solution of these latter is effected, add a few drops of solution of potassium permanganate, strain through a piece of hair cloth and after permitting to settle, bottle. The addition of a little extract of logwood will render the ink blacker when first written with. Half an ounce of sugar to the gallon will render it a good copying ink.

7. Professor Gintl proposes the following: A concentrated solution of logwood is treated, first. with 1% of alum, and then with the same proportion of lime water until a permanent precipitate is formed. A few drops of a weak solution of chloride of calcium are added, until a bluish black color is obtained; then hydrochloric acid is added drop by drop until the liquid turns red. A little gum and about 1% glycerine are then added, and the ink is ready for use.

8. Red Copying Ink.—Dissolve 50 parts extract of logwood in a mortar in 750 parts distilled water without the aid of heat; add 2 parts chromate of potassium and set aside. After twenty-four hours add a solution of 3 parts oxalic acid, 20 parts oxalate of ammonium, and 40 parts sulphate of aluminum in 200 parts distilled water, and again set aside for twenty-four hours. Now raise it once to boiling in a bright copper kettle, add 50 parts vinegar, and after cooling fill into bottles and cork. After a fortnight decant. This ink is red in thin layers, writes red, gives excellent copies in brownish color, and turns blackish brown upon the paper.

9. Parisian Copying Ink.—Best kinds of copying inks are, as is well known, prepared by adding a percentage of alum, sugar, and glycerine, or salt, to the extract of logwood. Such inks have a violet tint, and gradually become blacker on paper. The copy is, however, very pale at first, and is often indistinct. The Parisian copying ink is distinguished from the common kinds by its appearance more or less yellow in a liquid state, and by producing a distinct bluish black on paper. It has the additional advantage of preserving its fluidity, while the common kinds soon thicken. Professor Gintl recommends the following method of preparing an ink which has all the advantages of the Parisian: A strong solution of logwood extract is treated with 1% of alum, and then with as much lime water, so that a permanent precipitate is formed. Some drops of weak chloride of lime are then added, so that a perceptible bluish black color is attained, and hydrochloric acid is added by drops till a red solution is obtained. A little gum is then added, with 0·5% of glycerine.—*English Mechanic.*

10. Violet Copying Ink.—For blue violet, dissolve in 300 parts boiling water methyl violet 5B, Hofmann violet 3B, or gentiana violet B. For reddish violet, dissolve in a similar quantity of water methyl violet BR. A small quantity of sugar added to these inks improves their copying qualities. If the writing, when dry, retains a bronzy appearance, more water must be added.

Inks which Yield Copies without a Press.—**1.** Black:

Nigrosine C. P. fine.....10 oz.
Glucose A..... ..... 1½ oz.
Hot water..... 1¾ pt.
Glycerine..... ..... 1¼ oz.

Dissolve the nigrosine by trituration in the hot water, then add the other ingredients and strain through a piece of silk. If too thick when cold, dilute to the proper consistence with water.

2. Blue:

Cotton blue (aniline) C. B.....6 oz.
Glucose A..... .....1 oz.
Glycerine..... .....¼ oz.
Hot water. .....2 pt.

Proceed as directed for black ink (above). In preparing these inks it is essential that the water should be kept quite hot while the ope-

ration of trituration is performed. The trituration should be continued until all of the dye has been taken up by the water. The straining must be performed hot, otherwise the filtering cloths quickly become clogged. In purchasing nigrosine and aniline blue, obtain if possible the purest quality. Cheap grades of these dyes are almost invariably heavily adulterated with dextrine.

3. Dissolve an aniline color in water, and add a little glycerine. It is well to dissolve the color in alcohol first. About 10% glycerine should be sufficient.

4. Mix white sugar with the ink; 1½ drm. sugar to 1 oz. ink. Use this with an ordinary pen, and place over the writing a moistened sheet of unsized paper. Lay both leaves between two layers of carpet; put the whole under a piece of board large enough to cover. Then stand on the board for a few seconds. An excellent impression will be found on the copying paper.

	Parts.
5. Extract of logwood	200
Sulphate of iron	8
Chromate of potash	2
Indigo carmine	16
Gum arabic	2
Glycerine	20
Salicylic acid	0·3
Vinegar	100
Distilled water	900

Dissolve the extract of logwood completely in a portion of the water by heating at a temperature of about 200° F. Then add the rest of the water and the vinegar, in which the other ingredients have been mixed in the order given above and dissolved. Mix thoroughly, and set aside for a few days to settle. Another formula, which provides an ink of a different color, but equally satisfactory, is as follows:

	Parts.
6. Water	1,000
Extract of logwood	200
Indigo carmine	20
Alum	25
Sulphate of iron	4
Sulphate of copper	3
Glucose	16
Gum arabic	2
Chromate of potash	2
Salicylic acid	0·3

7. Writing, too old to copy by moisture only, or from thin writing ink, may be copied as follows: In ½ pt. water dissolve about a tablespoonful white sugar, and to the solution add a sufficient quantity of the ferrocyanide of potassium to distinctly color it, also about ½ gill pure muriatic acid (free from iron). Moisten white tissue paper with this, partially dry it with a blotter, place the writing to be copied in contact with it, and keep under pressure for about five minutes. With most inks this recipe will give very good results.

Chrome Ink.—Extract of logwood, ½ oz.; gum, ¼ oz.; water, 1 pt. Dissolve also in 12 oz. water, ½ oz. yellow chromate of potash (or ½ oz. bichromate and bicarbonate of potash), and mix the two solutions. The ink is ready for immediate use.

Drier for Inks used on Bookbinders' Cases.—Beeswax, 2 oz.; gum arabic (dissolved in acetic acid q. s. to make a thin mucilage), ½ oz.; brown japan, ½ oz. Mix with 2 lb. good cut ink.

Diamond Ink.—Diamond ink is made by mixing with hydrofluoric acid enough barium sulphate to give it consistency, so that it will not spread, and show well on the glass. Ammonium fluoride may also be added. After the writing has stood some time it is washed or dusted off, and the etching appears. See **Etching.**

Drawing Ink.—1. A very black and indelible drawing ink may be made by dissolving shellac in a hot water solution of borax, and rubbing up in this solution a fine quality of India ink. After using, dip the drawing pen in alcohol and wipe dry, to keep it clean and bright.

2. The addition of 1 part of carbolic acid to 80 parts of the fluid India ink, while it does not impair its fluidity, causes it to dry rapidly even in heavy lines, so that they can be varnished over. The proper amount of carbolic acid to be added in any case may be ascertained by adding drop by drop the ordinary apothecary's solution of it in alcohol until varnishing does not affect the definition of a test line by causing it to run. The addition of too much carbolic acid is indicated by the transparancy of the line and the inability to draw fine lines, a condition easily remedied by the addition of more of the fluid ink.

See also India Inks below. For a manufactured ink Higgins' waterproof is highly recommended.

Enameled Cards, Ink for.—An ink that may be applied to enameled calling or playing cards that will show perfectly plain, and that will not destroy the gloss, is printer's ink diluted with oil of lavender.

Indorsing Inks.—Dissolve 1 part of aniline blue, violet or magenta, according to the color required, in a mixture of 30 parts of alcohol and 30 parts of glycerine.

Ink Eraser.—1. Mix equal parts of oxalic and tartaric acids in powder. When to be used, dissolve a little in water. It is poisonous.

2. Oxalic acid mixed with citric acid may be used.

3. Equal parts of cream of tartar and citric acid in solution with water.

4. A more powerful one, a saturated solution of oxalic acid in water. The red inks are made of various bases for the color, as Brazil wood, cochineal, and aniline red. The aniline red may be removed by alcohol acidulated with nitric acid. No receipt for the other reds.

5. Cold aqueous or acetic acid solution of calcium hypochlorite, bleaching powder or eau de Javelle.

6. Immerse blotting paper or any similar material in a hot concentrated solution of citric acid, roll it into a pencil, and coat the larger portion of it with paper or lacquer. Moisten the eraser with water, and rub over the ink to be removed. Drop upon the ink spot a drop of water containing chloride of lime. The ink immediately disappears.

7. Chloride of lime, ½ pound, is added to 2 parts water. Allow this to stand for 24 hours, then strain and add 1 drm. acetic acid to every ounce of the chloride of lime used. Apply this liquid to the blot without rubbing. When the ink has disappeared absorb the fluid with blotting paper.

Engraving Inks.—Under the term engraving inks will be included all inks employed for engravers, whether on stone, wood, or metal.

1. Black.—Coal tar, 100 parts; lampblack, 36 parts; Prussian blue, 10 parts; glycerine, 10 parts. This ink may be used for lithography, chromo lithography, autography, etc. 2. To the varnish obtained by boiling linseed oil, as for printing ink, is added as much best calcined Paris black as can be ground up with it. This is a litho printing ink. For copper plate printing, the Paris black is replaced by lampblack. 3. Eight oz. mastic in tears, 12 oz. shellac, 1 oz. Venice turpentine; melt together; add 1 lb. wax, 6 oz. tallow; when they are dissolved, add 6 oz. hard tallow soap shavings, and mix; then add 4 oz. lampblack. Mix all well together, let cool slightly, pour into moulds, and cut into cakes of convenient size. This ink is suited for writing on stones. 4. To render 3 liquid, for writing and drawing on transfer paper, it is warmed in a pot, and then rubbed down with soft water (rain or distilled water). The pen should be dipped into oil and wiped before use. 6. Pure white wax, 4 parts (best quality); white tallow, 2 parts; gum lac, 2 parts; lampblack made from burnt rags, 1 part; oil copal varnish, 1 part. Melt the wax over a slow

fire, then add gum lac crushed small, then mix in the soap in shavings, then the oil varnish for cakes. When wanted, thin with water from the cake, and for crayons cut from the paint, which must be brittle if it is good.

Colored.—Colored inks are made by adding to the varnish already described certain pigments, of which the principal are as follows:

1. Blue.—Two oz. celestial blue, 3 oz. marine blue.

2. Brown.—Two oz. burnt umber, 1 oz. rose pink.

3. Green.—Two oz. mineral green, 3oz. chrome green.

4. Lilac.—One oz. Prussian blue, 2 oz. Chinese red.

5. Orange.—Two oz. orange red, 1 oz. flake white, ground up with Canada balsam, and omitting the linseed oil varnish.

6. Pink.—Two oz. mineral pink, 1 oz. satin white.

7. Red.—Five oz. mineral orange red, 2 oz. Chinese red.

Exchequer Ink.—Bruised galls, 20 lb.; gum, 5 lb.; green iron sulphate, 4½ lb.; soft water, 22½ gal. Macerate for three weeks, stirring frequently. This ink is very enduring.

Fireproof Paper and Ink for Documents.—Fireproof paper may be made, according to the *Pharmaceutische Zeitung*, from a pulp consisting of 1 part vegetable fiber, 2 parts asbestos, ⅛ part borax, ⅛ part of alum. The ink is made from 85 parts graphite, 0·8 part copal varnish, 7·5 parts copperas, 30 parts tincture of nutgalls, and a sufficient quantity of indigo carmine.

Frost Proof Ink.—Aniline black, 1 drm.; rub with a mixture of concentrated hydrochloric acid, 1 drm; pure alcohol, 10 oz. The deep blue solution obtained is diluted with a hot solution of concentrated glycerine, 1½ drm., in 4 oz. of water. This ink does not injure steel pens, is unaffected by concentrated mineral acids or strong alkalies, and will not freeze at a temperature of 22° or 24° below zero.

Gluten Ink.—Dissolve wheat gluten, free from starch, in weak acetic acid, of the strength of common vinegar; mix 10 grn. lampblack and 2 grn. indigo, with ¼ oz. of the solution, and a drop or two of the oil of cloves.

Glass, Inks for Writing on.—1. A solution of hydrofluoric acid applied to glass previously coated with wax, and the matter scratched through with a style.

2. Three parts barium sulphate, 1 part ammonium fluoride, and sufficient sulphuric acid to decompose the ammonium fluoride and make the mixture of a semi-fluid consistence. It should be prepared in a leaden dish and kept in a gutta percha or leaden bottle.

Green Inks.—Green Black Ink.—1. Take 15 parts bruised gallnuts and 200 parts of water, boil for about an hour, strain, and then add to the liquor 5 parts sulphate of iron, 4 parts fine iron shavings and a solution of ½ pint of powered indigo in 3 parts of sulphuric acid. This ink writes green, but turns black after a few days; it flows very well from the pen.

2. Calcine acetonitrate of chrome; dilute the green powder with sufficient water.

3. Mix good clear blue and yellow inks in the proportions necessary to give the desired tint.

4. Sap green dissolved in very weak alum water.

5. Verdigris, 2 oz.; cream of tartar, 1 oz.; water, ½ pt.; reduce one-half by boiling, and filter.

6. Rub 3½ drm. Prussian blue and 3 drm. gamboge, with 2 oz. mucilage, and add ½ pt. water.

7. A soution of recently precipitated hydrated oxide of chromium in liquor of ammonia, diluted with distilled water, q. s. This produces a beautiful dark green liquid, perfectly anti-corrosive.

8. Dissolve 180 grains bichromate of potassa in 1 fl. oz. of water, add while warm ½ oz. spirit of wine, then decompose the mixture with concentrated sulphuric acid until it assumes a brown color; evaporate this liquor until its quantity is reduced to one-half, dilute it with 2 oz. distilled water; filter it, add ½ oz. alcohol, followed by a few drops of strong sulphuric acid; it is now allowed to rest, and after a time assumes a beautiful green color. Add a small quantity of gum arabic and it is ready for use.

9. A strong solution of binacetate of copper in water, or of verdigris in vinegar; 3 (klaproth) verdigris, 2 oz.; cream of tartar, 1 oz.; water, ½ pt. Boil to one-half, and filter.

10. Two parts acetate of copper, 1 part carbonate of potash and 8 parts water. Boil till one-half is evaporated, and filter.

Gold Ink.—See also Silver Ink below.—Honey and gold leaf equal parts; triturate until the gold is reduced to the finest possible state of division, agitate with 30 parts of hot water, and allow it to settle. Decant the water and repeat the washing several times; finally dry the gold and mix it with a little weak gum water for use.

Liquid Gold for Vellum.—Grind gold leaf with gum water. Add a little bichloride of mercury, and bottle.

Hektogxaph Ink.—1. The ink is prepared by dissolving 1 oz. of aniline violet or blue (2 R B to 3 B) in 7 fl. oz. of hot water, and, on cooling, adding 1 oz. of wine spirit with ¼ oz. of glycerine, a few drops of ether, and a drop of carbolic acid. Keep the ink in a well stoppered bottle.

2. Use a strong aqueous solution of nigrosine (aniline black) in the proportion of about 1 of the coloring material to 5 or 7 of water. It must be a saturated solution, rather thick.

3. Nigrosine black	1 part.
Water	14 parts.
Glycerine	4 parts.

This will make a black ink suitable for use with the hektograph. In order to make it copy add more glycerine, gum arabic, or sugar. For a description of the Hektograph, see **Hektograph.**

Horticultural Ink.—1. Blue vitriol, 1 oz.; sal-ammoniac, ½ oz. (both in powder); vinegar, ¼ pt.; dissolve. A little lampblack or vermilion may be added. For iron, tin or steel plate.

2. Verdigris and sal ammoniac, of each ½ oz.; levigated lampblack, ½ oz.; common vinegar, ¼ pt.; mix thoroughly. Used for either zinc, iron or steel labels.

Ink and Paper, Incombustible.—The pulp for the paper is composed of vegetable fiber, 1 part; asbestos, 2 parts; borax, ⅛ part; alum, ⅛ part. The ink can be used in either writing or painting, and is made according to the following recipe: Graphite finely ground, 22 drm.; copal or other resinous gums, 12 grn.; sulphate of iron, 2 drm.; tincture of nutgalls, 2 drm.; sulphate of indigo, 8 drm. These substances are thoroughly mixed and boiled in water. See also *Fireproof Inks* above.

Incorrodible Ink.—This name has been given to several preparations of a resinous character, capable of resisting the action of damp and acids.

1. Boiled linseed oil, ground with lampblack and Prussian blue, of each q. s. to impart a deep black color. It may be thinned with oil of turpentine.

2. Good copal or amber varnish colored with either plumbago or vermilion.

3. Trinidad asphaltum (genuine), 1 part; oil of turpentine, 4 parts; color as last.

4. (Close.) Copal (in powder), 25 grn.; oil of lavender, 200 grn.; dissolve by a gentle heat, and add of lampblack, 3 grn.; indigo, 1 grn. (both in impalpable powder); or vermilion, q.s.

5. (Sheldrake.) Asphaltum dissolved in amber varnish and oil of turpentine, and colored with lampblack.

Indelible Ink.—1. Aniline Inks, to Render Indelible.—To render aniline inks indelible on paper

it will be necessary to coat the reproduction with some preparation. An excellent compound consists of collodion dissolved to the consistency used by photographers with 2% of stearine added.

2. The following ink is recommended for marking linen: Triturate 1·75 drm. aniline black with 240 drops strong hydrochloric acid and 42 drm. strong alcohol. The mixture is diluted with a hot solution of 2·5 drm. gum arabic in 170 drm. water. Experimentation is to be recommended with the various colors used. It is impossible to furnish any positive information on such matters without first engaging the services of an expert dyer to experiment on the matter. Rosin and salt are added to soap mixtures in order to produce a harder compound.

3. The *Apotheker Zeitung* gives the following formula: 1·75 grm. aniline black are ground up with 40 drops hydrochloric acid and 42 grm. alcohol, and the liquid is diluted with a hot solution of 2·5 grm. gum arabic in 170 grm. water. If the aniline black solution is diluted with a solution of 2·5 grm. shellac in 170 grm. spirit instead of gum water, the result is an ink suitable for writing on wood, brass or leather.

1. Marking Ink for Linen, etc.—Dissolve shellac in a little water by boiling it with about ⅛ part of borax, and add to this solution a sufficient quantity of nigrosine to produce the proper color.

2. Indelible Ink for Marking Linen.—Add caustic alkali to a saturated solution of cuprous chloride until no further precipitate forms; allow the precipitate to settle, draw off the supernatant liquid with a siphon, and dissolve the hydrated copper oxide in the smallest quantity of ammonia. It may be mixed with about 6% of gum dextrine for use.

3. Asphaltum, 1 part; oil of turpentine, 4 parts; dissolve and temper with printer's ink. Best used with a stamp.

4. Marking Ink.—The following recipe affords a marking ink which is said to flow freely from the pen without running or blotting, becoming perfectly black upon the application of moderate heat, and which does not destroy the quality of the finest cambric: Nitrate of silver, 1 oz.; carbonate of soda (crystallized), 1½ oz.; tartaric acid, 100 grn.; strong liquor ammoniæ, 2 fl. oz.; archil, ½ fl. oz.; white sugar, 1 oz.; powdered gum arabic, 1½ oz. Dissolve the nitrate of silver and carbonate of soda separately in distilled water; mix the solutions, collect and wash the precipitate, still moist, in a Wedgwood mortar, and add to it the tartaric acid, rubbing them together until effervescence has ceased; add liquor ammoniæ in sufficient quantity to dissolve the tartrate of silver; then mix in the archil, white sugar and gum arabic, and add as much distilled water, if required, as will make 6 fl. oz. of the mixture.

5. The following are highly recommended by Dr. Reimann: The linen is first moistened with a fluid consisting of a mixture of 2 parts carbonate of soda in crystals, 2 parts gum arabic, 8 parts of water and then dried. When quite dry it is rubbed with a glass cloth to render it as smooth as possible, so that it may be easier to write upon. The composition of the ink itself is as follows: 1⅞ pt. nitrate of silver, 16 pt. distilled water, 2 pt. gum arabic and ⅛ pt. of sap green. The nitrate of silver is first dissolved in the distilled water, and the gum arabic and sap green are subsequently added. Use a quill pen.

6. For very fine linen the following ink is best employed: 4 pt. nitrate of silver, 24 pt. distilled water. To this solution liquid ammonia is added until the precipitate which is first formed is redissolved. Then a little sap green, indigo, etc., are ground together and dissolved in a solution of 4 pt. gum arabic, and this solution and that of the nitrate of silver are mixed together. The whole is then diluted until it occupies 32 parts. This ink is very limpid and easy to write with. When dry a hot iron need only be passed over the surface of the linen, when the letters will at once make their appearance, their tint being a deep black. The ink does not injuriously affect even the finest linen. The discovery of an aniline black has led to the employment of this coloring matter in marking linen.

7. The ink made with nitrate of silver can be removed by washing the linen with a solution of hyposulphite of soda or by moistening it with a solution of bichloride of copper and then washing with liquid ammonia. This is not the case with the aniline ink, the color of which cannot be removed by any chemical agent whatever. Linen, therefore, marked with this ink can never be appropriated by other persons than the rightful owner.

8. Such aniline ink may be prepared in the following way: 8½ grn. of bichloride of copper are dissolved in 30 grn. of distilled water; then are added 10 grn. of common salt and 9½ grn. of liquid ammonia. A solution of 30 grn. of hydrochlorate of aniline in 20 grn. of distilled water is then added to 20 grn. of a solution of gum arabic, containing 2 pt. water, 1 pt. gum arabic and lastly 10 grn. of glycerine. Four parts of the aniline solution thus prepared are mixed with 1 part of the copper solution. The liquid which results has a green appearance, and may be at once employed for marking linen, since it invariably becomes black after a few days. A steel pen may be employed as well as a quill. If it is desirable not to wait so long for the appearance of the black color, a hot iron may be passed over the writing when the ink is dry, or the linen may be held over the flame of a spirit lamp, or over a hot plate or hot water, when the black tint will readily appear. It is a good plan to put the linen when marked into a tepid solution of soap, which has the effect of bringing out a fine bluish tint. The ink must be so limpid that it is able to permeate the tissue of the linen, so that the marks appear on both sides.

9. Dissolve 25 grn. of gum copal powder in 200 grn. of lavender oil by the aid of a gentle heat; then add 2½ grn. of lampblack and ½ grn. of powdered indigo. To be applied to paper with a quill pen.

10. Elsner prepares an ink which resists the action of bleaching agents, thus: Take equal parts of copperas and vermilion, powder thoroughly, sift and grind the finest portions with linseed oil; finally squeeze through linen. A thick paste is thus obtained which can be used either for writing or printing on calico or wool.—*Les Mondes.*

11. Bottger prepares an ink that does not corrode steel pens by triturating 3·65 grn. of aniline black with 22 grn. of alcohol and 4 drops of hydrochloric acid; a porcelain mortar is employed, and the paste thus produced is mixed with 1·82 grn. of gum arabic previously dissolved in 85 grn. of hot water. If this ink be added to an alcoholic solution of shellac (21 gr. of lac to 85 of alcohol), a black product results, suitable for coloring leather and wood.—*Dingler's Polytech. Journal.*

12. If the ink is to be used for writing or drawing and there is no danger of the letters, etc., being rubbed off mechanically, printing ink or Indian ink may be used.

13. Printing ink sinks into woven fabrics to a considerable depth and will last a long time. It is probably one of the cheapest marking inks to be used with stencils.

14. In many cases Indian ink answers as well, and in some cases, as for engrossing valuable documents, it is the only safe ink, since nothing but the destruction of the document *itself* will be able to obliterate it. It is made by triturating 100 grn. of best Indian ink (Chinese) with very dilute hydrochloric acid (about 22 parts of absolute hydrochloric acid in 1,000 parts), or

with a solution of acetate of manganese in diluted acetic acid.

15. Another fine indelible ink, which resists all ordinary reagents, is made by means of vanadium. Vanadium and its salts are rather expensive still, although their price has fallen during the last few years to about one-tenth of what it was formerly.

16. This ink consists of lampblack and caustic soda, mixed with gelatine and caustic soda. It is said to be indelible and to resemble China ink.

17. India ink, ground up with ordinary black writing ink, forms a cheap indelible ink for common purposes. It will resist the action of chlorine, most acids, and even ablution with a brush or sponge.

18. Ink, Indelible.—The following recipe is given by *Puscher:* Dissolve 4 parts of aniline black in 16 parts by weight of alcohol, with 60 drops strong hydrochloric acid, and dilute the dark blue solution with 90 parts by weight of water, in which 6 parts of gum arabic has been previously dissolved. This ink is said not to act upon steel pens or to suffer any alteration by alkalies or acids.

19. By adding ferrocyanide of potassium to ordinary ink an indelible writing ink may be obtained. The removal of such an ink by acid would result in the production of Prussian blue. —*Pharmaceutische Zeitung.*

20. Gelatine, 2 grn.; bichromate of potassium, 2 grn.; nigrosine, 10 grn.; water 2 fl. oz. Dissolve the gelatine and nigrosine in most of the water and the bichromate in the remainder. Mix the two solutions in an amber colored bottle.

21. Dissolve with the assistance of heat, 20 parts of brown shellac in a solution of 30 parts of borax in 300 to 400 parts of water and filter the solution while hot. Then add to the filtrate a solution of 10 parts of aniline black soluble in water, $\frac{1}{5}$ part of tannin, $\frac{1}{10}$ part of picric acid, 15 parts of spirit of sal ammoniac and ¼ oz. of water.

22. Solution of permanganate of potass, followed by a solution of oxalic acid. If necessary repeat. Cyanide of potassium will do it, but it is not easy to use; and is poison.

23. Dissolve ¼ oz. nitrate of silver in about 2 oz. of distilled water, add carbonate of soda so long as a precipitate falls; wash this precipitate, and add tartaric acid till effervescence ceases. Wash the insoluble tartrate of silver, and dissolve in 1 oz. of strong solution of ammonia. Use this with a quill pen and hot iron as generally directed. Jetoline marking ink is also an excellent preparation, made with aniline dyes.

24. One part of pyrogallic acid is triturated with 3 parts of powdered acacia, 3 parts of vanadate of ammonium and a sufficient quantity of cold distilled water, in a porcelain capsule, until a uniform mixture is made. This forms a fine ink, flowing black from the pen. This may also be made into a stencil ink by using less water and adding a little glycerine.

25. A composition prepared by mixing well triturated carbon with an alkaline silicate (potash or soda), the following proportions answering well: Lampblack, 1 part; sirupy silicate solution, 12 parts; ammonia liquor, 1 part; distilled water, 38 parts.

26. An ink that cannot be erased, even with acids, is obtained by the following: To good gall ink, add a strong solution of fine soluble Prussian blue in distilled water. This addition makes the ink, which was previously proof against alkalies, equally proof against acids, and forms a writing fluid which cannot be erased without destruction of the paper. The ink writes greenish blue, but afterward turns black.—*Pharmacist.*

27. For Rubber Stamps.—An excellent marking ink that dries rapidly and is free from grease may be cheaply prepared, by dissolving:

Crystallized aniline black	½ oz.
In pure alcohol	15 oz.
And adding concentrated glycerine	15 oz.

to the solution. This liquid is poured upon the cushion and rubbed with a brush.

28. Red marking ink, unaffected by soap alkalies is made as follows: Enough finely powdered cinnabar to form a moderately thick liquid is very intimately mixed with egg albumen previously diluted with an equal bulk of water, and beaten to a froth and filtered through fine linen. Marks are formed on cloth with this liquid by means of a quill and are fixed after they have become dry by pressing on the reverse side with a hot iron. This might work in a rubber stamp by adding glycerine, but it is recommended to use the quill.

29. Tyrian Purple Ink for Marking Linen.—Von Bele gives the following method for preparing an ink for marking linen and cotton: Neutralize 75 grn. carbonate of ammonia with pure nitric acid, and triturate 45 to 60 grn. carmine with the solution. Mordant the fabric with a mixed solution of acetate of alumina and tin salt, and write upon it, when it is perfectly dry, with the ink.

30. Purple Marking Ink.—A purple marking ink can be prepared by mixing 1 part bichloride of platinum with 16 parts distilled water. The place where the letters have to be written must be moistened with a solution of 3 parts carbonate of soda, 3 parts gum arabic and 12 parts water. The spot is then dried and made smooth. After the letters have been written with platinum ink and become dry, the linen is moistened with a solution of 1 part chloride of tin in 4 parts distilled water, when an intense and beautiful purple red color makes its appearance.

31. Indelible Ink for Paper.—A good formula is the following: Gelatine, 2 grn.; bichromate of potash, 2 grn.; nigrosine, 10 grn.; water, 1 fl. oz. Dissolve the gelatine and nigrosine in most of the water, and the bichromate of potassium in the remainder. Mix the two solutions in an amber colored bottle. If it is found that the ink gums in the pen, the quantity of gelatine and bichromate may be somewhat reduced. But the ink, when properly made, and dry, cannot be entirely removed from paper by hot or cold water, acids or alkalies.

32. Ink for Marking Textile Fabrics.—Triturate 4 parts of powdered soluble nigrosine in about 15 parts of hot water, and strain the hot solution repeatedly through fine silk, or filter it through filter paper, using a hot funnel.

33. *a.* Dissolve in 60 grm. water 8·25 grm. crystalline chloride of copper, 10·65 grm. chlorate of soda, 5·35 grm. chloride of ammonium.

b. Dissolve 20 grm. hydrochlorate of aniline in 30 grm. of distilled water, add 20 grm. solution of gum arabic (1 part of gum to 2 of water), 10 grm. glycerine. If 4 parts of the solution *b* is mixed cold with 1 part solution *a*, a greenish liquid is obtained which may be used at once for marking linen, but as it decomposes in a few days, it is better to preserve the two solutions separately, mixing when desired for use. The writing is at first greenish, but is blackened by exposure to steam.

A Two-Bottle Marking Ink. By R. Wright.—In *The Chemist and Druggist*, the following formulæ were given:

No. 1 Solution.

Chloride of copper (in crystals)	8·52 grn.
Chloride of sodium	10·65 grn.
Chloride of ammonium	5·35 grn.
Water	1 fl. drm.

Dissolve.

No. 2 Solution.

Hydrochlorate of aniline	20 grn.
Distilled water	30 min.
Mucilage of acacia	20 min.
Glycerine	10 min.

Dissolve.

For use as a marking ink, 4 drops of No. 2 solution are mixed with 1 drop of No. 1.

In *The Chemist and Druggist* for April 30, 1887, the following formula was recommended:

Crawshaw's black dye	1 drm.
Acetic acid	1 drm.
Rectified spirit	1 drm.
Water	4 drm.

Digest the dye in the mixed liquids at a gentle heat till dissolved; then add 4 fl. drm. of glycerine, and mix. Serves as a marking ink on the addition of a mordant.

In the course of some experiments, made with a view of discovering a reliable method, the above mentioned recipes were tried, but the results were not very encouraging. The first mentioned solution, when mixed, gives an ink which is not nearly thick enough to write with, and as a result it has a tendency to run. Another disadvantage is that the writing is almost colorless when freshly done, and it is sometimes very difficult to trace the marks. On exposure to the air it becomes considerably darker, but seldom, if ever, yields a jet black, even on long exposure and subsequent boiling with soap lye. With the second formula the results were just as unsatisfactory: once or twice boiling with soap had the effect of almost entirely obliterating the marks. From this it was evident that some other process would have to be adopted in order to secure anything like good results.

In Cooley's "Cyclopedia," page 1626, in an article on "Tar Colors," the following recipes are given for the production of aniline black.

1. Dissolve 20 parts of potassium chlorate, 40 parts of cupric sulphate and 16 parts of ammonium chloride in 50 parts of water, warming the liquid to about 60°, and then remove it from the water bath. In about three minutes the solution froths up and gives off vapors which strongly attack the breathing organs. If the mass does not become black after the lapse of a few hours it is again heated to 60°, and then exposed in an open place for a day or two, and afterward carefully washed out until no salts are found in the filtrate. For use in printing, the black paste is mixed with a somewhat large quantity of albumen, and the goods after printing are strongly steamed.

2. Mix equal weights of aniline (containing toluidine), hydrochloric acid and potassium chlorate with a minute quantity of copper chloride and a sufficient quantity of water, and leave the mixture to evaporate spontaneously, when a black powder will be obtained. From this it is evident that an aniline black may be obtained, by the action of an oxidizing agent upon aniline or aniline chloride in presence of a copper salt; and it was thought possible, by a rearrangement of the ingredients in the above processes, to produce two solutions which, when mixed, would be capable of giving rise to the production of the same color. With this object in view, the following solutions were prepared:

No. 1.

Commercial aniline	1 fl. drm.
Dilute hydrochloric acid, B.P.	2 fl. drm.
Thick mucilage of acacia	1 fl. drm.

No. 2.

Commercial aniline	1 fl. drm.
Dilute hydrochloric acid, B.P.	2 fl. drm.
Methylated spirit	1 fl. drm.
Thick mucilage of acacia	1 fl. drm.

Mix in the above order.

For mordants the following solutions were tried. No. 1, *Chemist and Druggist* formula given above, thickened with mucilage:

No. 3.

Potassium chlorate	20 grn.
Cupric sulphate	40 grn.
Ammonium chloride	20 grn.
Distilled water	6 fl. drm.
Thick mucilage of acacia	2 fl. drm.

Rub the solid ingredients to powder, to dissolve in the water (boiling), then add the gum solution and mix.

No. 4.

Copper chloride	40 grn.
Sodium chloride	30 grn.
Ammonium chloride	20 grn.
Potassium chlorate	20 grn.
Distilled water	5 fl. drm.
Thick mucilage of acacia	3 fl. drm.

Dissolve the solid ingredients in the water, previously heated to the boiling point; add the mucilage and mix.

Each of the aniline solutions was tried with the three mordants, with fairly satisfactory results. The aniline solution without spirit seemed to promise best, and certainly gives an indelible black with Nos. 2 and 3 copper solutions.

It occurred to me that possibly the aniline might be improved by the addition of a little toluidine, and one or two experiments were tried with the addition of the solid orthotoluidine. The following solutions were made:

No. 1.

Aniline	1 fl. drm.
Toluidine	10 grn.
Dilute hydrochloric acid, B.P.	2 fl. drm.
Mucilage of acacia	2 fl. drm.

Dissolve the toluidine in the aniline, add the acid and the mucilage and mix.

No. 2. Like No. 1, with the addition of 1 fluid drm. methylated spirit.

Both these solutions give good results with mordants Nos. 2 and 3; the marking is clear and distinct, and turns perfectly black when boiled with soap lye. No. 1 solution of aniline and toluidine, with No. 3 mordant, yields probably the best ink. A quill pen should always be used with inks of this character, and the goods, after being marked, should be left for a day or two before being washed, in order to give time for the chemical reaction which results in the production of the aniline black to take place.

I have by me now samples of linen which were marked with an ink of this character over three years ago, and which have repeatedly been boiled with a strong soap solution since then, and the marking is as distinct to-day as when first written. One of these specimens I inclose for your inspection. [*Results good.—Ed. C. & D.*]

Indestructible Ink.—1. Pulverized verdigris, ¾ oz.; sal ammoniac, 1½ oz.; lampblack, ½ oz.; water, 8¾ oz. Shake well before using.

2. Hausmann's Indestructible Ink.—Mix 1 part genuine Trinidad asphaltum with 4 parts oil of turpentine; color with a sufficiency of plumbago for black, or vermilion for red, ink.

3. Close's Indestructible Ink.—Mix 25 grn. powdered copal and 200 grn. oil of lavender by a gentle heat; color with 3 grn. lampblack and 1 grn. indigo, both in fine powder. If a red color is required, omit the lampblack and indigo, and add sufficient vermilion to make the mixture a good color.

4. Traille.—Dissolve gluten in pyroligneous acid. This produces a soap like fluid, which should be diluted to the strength of ordinary vinegar. Add to every quart of this fluid ½ oz. lampblack and 40 grn. of indigo. Reagents which destroy ordinary ink have no effect on it. It is of a beautiful color and flows readily from the pen. It cannot be effaced by water.

5. Gaffard.—Two parts lampblack; 24 parts potash water glass of the consistency of sirup; 2 parts aqua ammonia; 76 parts distilled water.

India Ink.—1. Indian ink consists of finely divided carbon cemented together by certain glutinous vegetable juices, gum, gelatine, etc. The precise nature of the cement or mucilage used by the Chinese in the manufacture of their inks is not known. But the greater part of the ink now sold as Indian ink consists of fine lampblack and glue. Purify fine lampblack by washing it with a solution of caustic soda,

dry and make it into a thick paste with a weak solution of gelatine containing a few drops of musk essence and about half as much ambergris; mould and dry. Instead of gelatine the following solution may be used: seed lac, 1 oz.; borax, ¼ oz.; water, 1 pt.; boil until solution is effected and make up with water to ¾ pt.

2. Purify fine lampblack by washing it with a solution of caustic soda, dry and make into a thick paste with a weak solution of gelatine, containing a few drops of musk essence and about half as much ambergris; mould and dry. Instead of gelatine the following solution may be used: seed lac, 1 oz.; borax, ¼ oz.; water, 1 pt.; boil until a solution is effected and make up with water to ¾ pt.

3. Dissolve horn strip with caustic kali root till it is melted. The brown liquid is to be boiled in an iron kettle until it is thick. Then pour on it boiling water, double its weight, and precipitate it with dissolved alum. Dry, grind and mix it with gum water and pour it in a mould. A few drops of essence of musk, or of ambergris, may be added as perfume.

4. Horse beans or the kernels of the stones of apricots.—Must be burnt in an oven till perfectly black, ground to a fine powder, and made into a paste with a solution of gum arabic, and then formed into cakes. [Last two formulas not recommended.—Ed.]

5. Mix the finest lampblack with a solution of 100 grn. of lac with 20 grn. of borax and 4 oz. of water.

6. Pure lampblack mixed with asses' skin glue and scented with musk.

7. For making a deep black Indian ink, which will also give neutral tints in its half shades, rub thoroughly together 8 parts lampblack, 64 parts water and 4 parts finely pulverized indigo. Boil the mixture until most of the water has evaporated; then add 5 parts gum arabic, 2 parts glue and 1 part extract of chiccory. Boil the mixture again till it has thickened to a paste, then shape it in wooden moulds which have been rubbed with olive or almond oil.

8. Most of the black Indian ink met with in commerce possesses the disadvantage that it blots when a damp brush is passed over it, or, as draughtsmen say, it does not stand. The addition of alum does but little good, but bichromate of potash accomplishes the object by rendering insoluble the glue which the ink contains, and thus making the ink permanent. The bichromate of potash possesses a deep yellow (almost red) color, but does not at all injure the shade of the ink, as 1% of it in a very fine powder, intimately mixed with the ink, is sufficient. The bichromate must always be mixed with the ink in a dry state, otherwise the latter might lose its friability in water. A drawing which has been made with this ink in the dark, or by artificial light, must be exposed to sunlight for a few minutes, which renders the bichromated glue insoluble in water. Draughtsmen who cannot provide themselves with such ink make use of a dilute solution of bichromate of potash in rubbing up the ink paper, if the ink is thick enough.

9. A substance much of the same nature and applicable to the same purpose as Indian ink may be formed in the following manner: Convert 3 oz. isinglass into size by dissolving it over a fire in 6 oz. of soft water; dissolve 1 oz. Spanish licorice in 2 oz. soft water in another vessel over a fire; grind up on a slab with a heavy muller 1 oz. ivory black with the licorice mixture; add this compound to the isinglass size while hot and stir well together till thoroughly incorporated. Evaporate away the water and then cast the remaining composition in a leaden mould slightly oiled, or make it up in any other convenient way. This composition will be found quite as good as the genuine article. The isinglass size mixed with the colors work well with the brush. The licorice renders it easily dissolvable on the rubbing up with water, to which the isinglass alone would be somewhat reluctant; it also prevents it cracking and peeling off from the ground on which it is laid.

10. Gray.—Pure lampblack made up with asses' skin glue and scented with musk.

11. Merimée.—Dissolve superfine glue in water, add a strong solution of nutgalls and wash the precipitate in hot water; then dissolve it in a fresh solution of glue, filter, evaporate to a proper thickness and form it into a paste with purified lampblack.

12. Seed lac, ½ oz.; borax, 1½ drm.; water, ½ pt.; boil to 8 oz., filter and make a paste of pure lampblack. When dry it resists the action of water.

The Chinese do not use glue in the preparation of their ink, but an infusion or decoction of certain seeds abounding in a glutinous, transparent mucilage, which imparts brilliancy and durability to the color. Starch converted into gum by means of sulphuric acid or British gum has been recommended as a substitute.—*M. Merimee.*

13. French.—Indian ink, diffused through water, acidulated with hydrochloric acid. For quills.

14. Indian ink diffused through water slightly alkalized with liquor of potassa. For metallic pens.

15. To improve Indian ink for drawing, so that even the thickest lines will quickly dry, add 1 part of carbolic acid to 80 parts of the ink. If, by mistake, too much has been added, it may be rectified by putting in more Indian ink. If the mixture is properly performed, the ink is as easy to draw with as it is without carbolic acid, but dries quickly and may even be varnished without discharging.

To Fix Indian Ink on Paper.—It is a fact well known to photographers that animal glue, when treated with bichromate of potash and exposed to the sunlight for some time, is insoluble in water. It has been found by analysis that Indian ink contains such animal glue, and consequently, if a small quantity of bichromate of potash be used with it, the lines drawn with such prepared ink will not be affected by water, providing that they have been exposed to the sunlight for about an hour.

Liquid India Ink.—A little glycerine added acts as a preservative, and causes the ink to flow well. Too much glycerine should not be used, as it will prevent the ink from drying, and in this case it is, of course, easily blotted or smeared. Keep in well corked bottles.

Imitation of India Ink.—Grind together lampblack and gelatine, the gelatinizing power of which has been partly destroyed by boiling with water. Scent with camphor and make into sticks.

Indulin Ink.—Coupier & Collins' blue black ink, known by the name of indulin, is prepared as follows: Dissolve 20 parts indulin in 1,000 parts water. This forms a writing ink of good color. This ink can be washed out with water.

Japan Ink.—1. Take of Aleppo galls ½ lb.; logwood chips and copperas, each ¼ lb.; gum arabic, 3 oz.; sugar, 1 oz.; sulphate of copper, ½ oz.; sugar candy, ½ oz. Put the galls and logwood in 6 qt. water. Boil slowly until the water is reduced in volume one half. Strain through cotton flannel, and add the other ingredients. Keeping the solution warm, stir until all the ingredients added are dissolved. It should then be placed in a deep glass vessel and allowed to settle. The ink may be removed from the settlings by pouring off carefully, or using a siphon. The gloss of the ink may be increased or diminished by increasing or diminishing the amount of gum used in the recipe. If carbolic acid be added until its odor is just perceptible, it will prevent moulding. Oil of cloves added will also effect the same result, and it gives the ink a less offensive odor.

2. Dissolve in ½ pt. soft water ⅔ oz. of potassium bichromate, and add the solution to 6 oz. of logwood extract, dissolved in 1 gal. of water; then dissolve in 1 gal. water by continued boiling, borax, 6 oz.; shellac, 1½ oz. *Mix* all together while warm and add 3 oz. of ammonia.

Lithographic Writing and Drawing Ink.—Tallow, 4 oz.; wax, 4 oz.; soap, 4 oz.; shellac, 4 oz.; fine Paris black, q. s. This is an excellent ink for drawing on stone. For transfer paper the following proportions are better: Tallow, 4 oz.; wax, 5 oz.; soap, 4 oz.; shellac, 3 oz.; black, about half the quantity used for stone. The fire for ink making should be a clear one, yet not low, as the operation requires some time. Put into the saucepan the tallow and wax and when melted throw in the soap a little at a time. It must be put in in small pieces and time be allowed for each piece to part with its water (which may be known by the cessation of the ebullition which follows). When the soap is dissolved in the wax and tallow, the heat must be continued until the dense, light colored fumes passing off can be ignited upon the application of a light. If the flame be two or three inches high the saucepan may be removed from the fire, when the burning will probably be continued without further application of heat to the bottom. Stirring with a rod will facilitate the passing off of the vapor. It must be burned until the 12 oz. are reduced to nearly 8 oz. Then put out the flame and add the shellac a little at a time, taking care that it does not boil over. Add the black. Ink that is not sufficiently burnt becomes thick and slimy on standing for two or three hours after mixing with water. Place a grain or so on a saucer and drop upon it a little distilled water; watch it for a few seconds and notice whether the ink becomes lighter in color. If it does, it is a sign that the burning has been insufficient. Heat again and allow the white fumes to pass off for a few minutes without catching fire. Try the ink again. Cast it into sticks for convenient use.

Considerable difference of opinion appears to exist as to the quantity of black to be used. It is variously stated at from one-sixth to one-twentieth of the whole. It is better to err on the side of putting too little than too much black, because the former can be easily remedied. The black must be ground. If it be ground in turpentine and cautiously added to the ink the heat will vaporize the turpentine. If it is added in dry powder there will be considerable difficulty in diffusing it through the mass.—*Text Book of Lithography.*

Plate Transfer Ink.—The making of re-transfer ink for taking impressions from copper plates is conducted in the same manner as that for writing and drawing. In the following receipts it is preferable to burn only the first three of the ingredients by setting them on fire after they attain sufficient heat to do so. For the quantities first named they may burn for fifteen minutes. If after the other ingredients are melted the ink is too soft, it is best not to set them on fire, but to keep up the heat until the necessary degree of hardness is arrived at. Melt the ingredients in the order they are set down.

1. Tallow, 4 oz.; wax, 4 oz.; soap, 4 oz.; shellac, 4 oz.; pitch, 4 oz.

2. Varnish, 2 oz.; tallow, 1½ oz.; wax, 4 oz.; soap, 3 oz.; shellac, 5 oz.; pitch, 5 oz.; lampblack, 2½ oz.

3. Varnish, 8 oz.; tallow, 10 oz.; wax, 16 oz.; soap, 8 oz.; shellac, 14 oz.; pitch, 7 oz.; lampblack, 2 oz.

4. Tallow, 8 oz.; soap, 4 oz.; wax, 8 oz.; shellac, 4 oz.; lampblack, 1 oz.; Venice turpentine, 8 oz.; Burgundy pitch, 8 oz.

Where varnish is employed that should be burnt also.—*Text Book of Lithography.*

Lithographic Inks.—(Senefelder):

1. Lampblack, 1 part; soap, 4 parts; wax, 12 parts; tallow, 4 parts.

2. Lampblack, 1 part; soap, 4 parts; wax, 12 parts; shellac, 4 parts.

3. Lampblack, 1 part; soap, 4 parts; tallow, 8 parts; shellac, 8 parts.

4. Lampblack, 1 part; soap, 4 parts; wax, 8 parts; shellac, 4 parts.

5. Lampblack, 1 part; soap, 4 parts; wax, 8 parts; tallow, 4 parts; shellac, 4 parts.

6. Lampblack, 1 part; soap, 4 parts; wax, 6 parts; tallow, 2 parts; shellac, 4 parts; mastic, 3 parts; Venice turpentine, 1 part.

7. Lampblack, 1 part; soap, 4 parts; wax, 2 parts; tallow, 6 parts; shellac, 3 parts; mastic, 5 parts.

Lithographic Ink.—1. Tallow, 2 oz.; *virgin* wax, 2 oz.; shellac, 2 oz.; common soap, 2 oz.; lampblack, ½ oz. The wax and tallow are first put in an iron saucepan with a cover, and heated till they ignite; while they are burning the soap must be thrown in in small pieces, one at a time, taking care that the first is melted before a second is put in. When all the soap is melted the ingredients are allowed to continue burning till they are reduced one-third in volume. The shellac is now added, and as soon as it is melted the flame must be extinguished. It is often necessary in the course of the operation to extinguish the flame and take the saucepan from the fire, to prevent the contents from boiling over; but if any parts are not completely melted, they must be dissolved over the fire without being again ignited. The black is now to be added. When it is completely mixed the whole mass should be poured out on a marble slab, and a heavy weight laid upon it to render its texture fine. The utmost care and experience are required in the making both the ink and chalk, and even those who have had the greatest practice often fail. Sometimes it is not sufficiently burned, and when mixed with water appears slimy: it must then be remelted and burned a little more. Sometimes it is too much burned, by which the greasy particles are more or less destroyed; in this case it must be remelted, and a little more soap and wax added. This ink is for writing or pen drawing on the stone. The ink for transfers should have a little more wax in it.—*Workshop Receipts.*

2. Mastic in tears, 8 oz.; shellac, 12 oz.; Venice turpentine, 1 oz.; melt together, add wax, 1 lb.; tallow, 6 oz.; when dissolved, further add hard tallow soap, in shavings, 6 oz.; when the whole is combined, add lampblack 4 oz.; mix well, cool a little, and then pour it into moulds or on a slab, and when cold cut it into square pieces.

3. M. Lasteyrie.—Dry tallow soap, mastic in tears, and common soda in fine powder, of each 30 parts; shellac, 150 parts; lampblack, 12 parts; mix as last. Both the above are used for writing on lithographic stones.

4. Autographic.—White wax, 8 oz.; and white soap, 2 to 3 oz.; melt; when well combined add lampblack, 1 oz.; mix well, and heat it strongly; then add shellac, 2 oz.; again heat it strongly; stir well together, cool a little, and pour it out as before. With this ink lines may be drawn of the finest to the fullest class, without danger of its spreading, and the copy may be kept for years before being transferred.

5. White soap and white wax, of each 10 oz.; mutton suet, 3 oz.; shellac and mastic, of each 5 oz.; lampblack, 3½ oz.; mix as above. Both the above are used for writing on lithographic paper. When the last one is employed, the transfer must be made within a week.

Remarks.—The above inks are rubbed down with a little water in a cup or saucer for use, in the same way as common water color cakes, or Indian ink. In winter, the operation should be performed near the fire, or the saucer should be placed over a basin containing a little warm or tepid water. Either a steel pen or camel's

hair pencil may be employed with the ink.—*Cooley.*

6. Ink.—Writing on Lithographic Stones.—Mastic in tears, 8 oz.; shellac, 12 oz.; Venice turpentine, 1 oz. Melt together, add 1 lb. wax, 6 oz. tallow; when they are dissolved add 6 oz. hard tallow soap shavings and mix. Then add 4 oz. lampblack. Mix all well together, let cool slightly, then pour into moulds, and cut into convenient shaped cakes.

7. Melt 10 oz. of wax, 8 oz. of shellac, 5 oz. of mastic, 4 oz. each of pure tallow and hard tallow soap, ½ oz. Venetian turpentine. Mix with these 2½ oz. of lampblack. This ink is rubbed up with water like water colors, and forms an emulsion.

Luminous Ink.—Phosphorous Luminous Ink: Phosphorous, ¾ drm.; oil of cinnamon, ¾ oz.; mix, cork well and heat gently until thoroughly united. A letter written with this ink can only be read in a dark room; the writing will have the appearance of fire.

Marking Ink for Packages.—1. Take lampblack and mix thoroughly with sufficient turpentine to make it thin enough to flow from the brush. Powdered ultramarine, instead of lampblack, makes a fine blue marking mixture for the same purpose.

2. An excellent and very cheap ink is made by mixing ¼ oz. of bichromate of potassa and 4 oz. of extract of logwood in a stone jar or demijohn with 2 gal. of hot water. Shake well and let it stand for about two weeks, shaking occasionally. See also *Indelible Inks* above.

For Bales.—

Shellac	2 oz.
Borax	2 oz.
Water	25 oz.
Gum arabic	2 oz.
Venetian red sufficient to color.	

Boil the borax and shellac in the water until they are dissolved, add the gum arabic, and withdraw from the fire. When the solution has become cold, complete 25 oz. with water and add Venetian red enough to bring it to a suitable consistency and color. This ink must be preserved in a glass or earthenware vessel.

Metals, Ink for Writing on.—1. Inks for writing on metallic surfaces may be made as follows: 2. One part verdigris (acetate of copper), 1 part sal ammoniac, ½ part soot, 10 parts water; stir well; write with a quill. 3. One grn. sulphate of copper dissolved in 20 grn. water; add 2 drops hydrochloric acid, and enough solution of gum arabic to make the ink adhesive. To make the writing appear at once, add a little pyrogallic acid. Write with a copper pen. 4. Dissolve 2 oz. shellac in 1 pt alcohol, filter through chalk, and mix with finest lampblack; forms a jet black lusterless ink, insoluble in water. 5. Take ½ lb. of nitric acid and 1 oz. muriatic acid. Mix and shake well together, and then it is ready for use. Cover the place you wish to mark with melted beeswax; when cold, write your inscription plainly in the wax clear to the metal with a sharp instrument. Then apply the mixed acids with a feather, carefully filling each letter. Let it remain one to ten hours; according to the appearance desired; then wash and remove the wax. 6. Make a saturated solution of sulphate of copper in gum water. Write with a quill pen. When quite dry, give the labels a coat of white hard varnish, the labels being slightly warmed before application. 7. Chloride of platinum, ¼ oz.; soft water, 1 pt.; to be kept in glass and used with a quill pen. 8. Verdigris, sal ammoniac, and levigated lampblack, of each ½ oz.; common vinegar, ¼ pt.; mix thoroughly. 9. Is the better, but rather expensive; both will do for zinc, iron or steel.

Non-Corrosive Ink (Haenle's).—Pulverized gallnuts, 50 parts; gum, 25 parts; sulphuric acid (in 800 parts of distilled or rain water), 25 parts; a few drops of chloride of mercury.

Papyrograph Ink.—Dissolve any of the soluble dyes in warm glycerine.

Perpetual Ink for Monuments.—1. One lb. of lampblack, and 10 lb. pitch; turpentine q. s.; mix without heat.

2. Pitch, 22 parts; lampblack, 2 parts; turpentine, q. s. Warm and stir.

Obliterated Ink.—1. Wash in warm water to remove salt if the paper has been immersed in sea water, and then soak in a weak solution of gallic acid, say 3 grn. to the oz.

2. Wash in clean water and soak in solution of proto-sulphate of iron, 10 grn. to the oz.

3. Apply a solution of potassium ferrocyanide with a brush, when the writing will appear in blue, if any iron is left of the original ink.

Ink, to Remove Oil from.—Add a little ox gall and vinegar to the ink.

Pharmaceutical Ink.—Pharmaceutical ink is the name applied by Kauffeisen (*Prag. Rundsch.*) to a solution of 30 parts of alizarin paste in a small quantity of water, in which 15 parts of bicarbonate of soda have previously been dissolved. This solution is added to an aqueous solution of 50 parts of logwood, with enough water to make the total weigh 2,000 parts, and filtered. Some iron filings and a few cloves are added next, and the mixture is exposed to the sunlight for a week, with frequent agitation. The liquid is then strained, and about ½% carbolic acid added to prevent moulding. K. claims for this ink the following virtues: Cheapness, great fluidity, absence of tendency to become acid, and therefore not attacking metallic pens, and finally permanency if exposed to light.

Portable Ink (Bœttger's).—Saturate several sheets of paper with aniline black, and press them together into a compact and portable mass. For writing it is merely necessary to tear off a piece of this paper and steep it in a little water.

Ink Powder.—1. Extract of logwood, 150 parts; bichromate of potash, 1½ parts. Pulverize and mix thoroughly with 8% of the weight of the whole of indigo blue.

2. One lb. nutgalls, 7 oz. copperas and 7 oz. gum arabic. Pulverize and mix. This amount of ink powder will make 1 gal. of good black ink. Two or three powdered cloves should be mixed with each pound of powder to prevent moulding.

3. Reduce best quality of soluble nigrosin to impalpable powder by grinding. The powder dissolved in water makes an excellent and durable ink.

4. A good ink powder, which might with a little mucilaginous material be made into blocks by pressure, consists of Aleppo galls, 3 lb.; copperas, 1 lb.; gum arabic, ½ lb.; white sugar, ¼ lb.; powder and mix; 2 oz. of this powder dissolved in 1 pt. of boiling water gives a very good ink.

Printing Ink.—Mix alcohol with tar, then fire the alcohol, and condense the vapors arising from the combustion of the mixture; 10 gal. of the oil thus made is then mixed by boiling with 1 gal. of burnt corn meal or flour and about 10 oz. of linseed oil as a drier. Doubtful.

Colored.—Printing inks may be made in a number of colors besides black. The principal are the following:

1. Blue.—Indigo gives a deep but dull blue; it is cold but permanent.

2. Prussian blue needs much grinding, and extra soap; it affords a deep bright color, and is useful for making greens.

3. Antwerp blue is easily ground to the proper degree of fineness, makes a good ink, and works clean and well; its tint is bright and light, with a slight green tendency.

4. Green.—Various shades of green may be produced by suitable admixture of blues and yellows. Prussian blue and chromate of lead make a good rich green; indigo and the same yellow, a deeper, duller color; Antwerp blue

and the same yellow, a brilliant rich green. The chromate must be quite pure to insure bright colors.

5. Purple.—Different shades of purple may be made by grinding together carmine or purple lake with Prussian blue.

6. Red.—Carmine may be readily ground into a fine ink of brilliant color by admixture with black ink varnish made with balsam of copaiba. It is expensive, but valuable for special purposes. 7. Crimson lake is easily reduced by the muller; it works clean, and does not require more soap than is contained in the varnish, but it does not possess much depth. 8. A deeper tone than can be obtained from commercial lake may be produced in the following manner: One oz. best cochineal, powdered, and boiled in 1 qt. water, till the coloring matter is extracted; let the cochineal subside, and pour the liquid into another vessel; when cold, gradually add some chlorate of tin, with constant stirring, till the supernatant liquid, on standing, becomes nearly colorless; then add a little powdered alum. Assist the solution by stirring; allow to subside; pour off the excess liquid; wash the colored residue with 3 or 4 waters, to remove the acid; and dry carefully and slowly. The addition of cream of tartar during the process will give a purple tint. 9. Vermilion may be used for red ink where neatness is required, as for title lines of books. The quantity varies much, and necessitates care in its proportions. It requires much soap to make it work clean. 10. For cheap work, such as posting bills, red lead may be used; it requires additional soap to make it work clean, and its color soon changes to black. 11. An excellent permanent red, of rich tone, may be produced from Indian red. 12. Venetian red is easily ground into a smooth ink, and requires but little more soap than the varnish usually contains; it is not very intense. 13. Two oz. mineral orange red, 1 oz. Chinese vermilion; grind in printers' varnish or oil, as prepared for ordinary printing ink. 14. Boil linseed oil till smoke arises, then apply a lighted paper stuck in a cleft stick, and then remove the pot from the fire, allowing the oil to burn till it can be drawn out into strings ½ in. long. Add 1 lb. rosin for each qt. oil, and ½ lb. dry brown soap cut into slices; put the latter in cautiously, as the water in the soap causes a violent commotion. Then grind up the oil with sufficient pigment; vermilion, red lead, carmine, Indian red, Venetian red, and the lakes are all suitable for printing ink. Grind on a stone with a muller.

15. Yellow.—The highest yellow is obtained from chromate of lead, which is easily ground into a fine ink, works freely and well, and requires but little soap beyond what the varnish contains. 16. Yellow ocher is easily ground into a fine ink; it gives a useful color, dull but permanent.

Copper Plate Printing Inks.—Take linseed oil, 1 pt., put into a dry iron saucepan and boil until it will readily ignite by applying lighted paper; let it burn ten minutes; now put the lid on and it will cease to burn; add nearly ½ oz. litharge, and stir well; when cool, ready for use, mix a little of this oil with lampblack, forming a thick paste; grind this very fine with a muller. The grinding is most important. Boil the oil out of doors.

1. Black.—Frankfort black, finely ground with boiled linseed oil, or, for very fine work, fat oil.

2. Take linseed oil, 1 pt.; boil out of doors in a dry saucepan till it will ignite on applying lighted paper; let it burn ten minutes, then put the lid on, and the flame will go out. Stir in ½ oz. litharge. When cool, grind into a paste with lampblack, using a muller.

3. Red.—Mineral orange red, 5 oz.; Chinese red, 2 oz.

4. Blue.—Celestial blue, 2 oz.; marine blue, 3 oz.

5. Green.—Mineral green, 2 oz.; chrome green, 3 oz.

6. Brown.—Burnt umber, 2 oz.; rose pink, 1 oz.

7. Lilac.—Prussian blue, 1 oz. Chinese red, 2 oz.

8. Pink.—Mineral pink, 2 oz.; satin white, 1 oz.

9. Orange.—Orange red, 2 oz.; flake white, 1 oz. The above to be ground and mixed with Canada balsam. Or,

10. Red.—Vermilion.

11. Yellow.—King's yellow.

12. Blue.—Smalts.

13. Green.—King's yellow—green.

14. Blue.—Prussian blue, and flake white.

15. Brown.—Burnt umber.

16. Dark Brown.—Burnt umber and Frankfort black.

17. Puce.—Frankfort black and vermilion.

18. Brown.—Frankfort black, and drop lake. These to be ground and mixed with nut or linseed oil.

19. Gold.—Gold bronze mixed with dark oak and mahogany varnish.

20. Silver, Copper, Ruby.—The same as for gold, merely substituting the different bronzes. Cards printed in gold, silver, or colors should, when dry, be placed on a very smooth copper or steel plate, not engraved, and passed through a copper plate press with rather a tight pressure; this would also improve the appearance of cards printed in like manner with letterpress.

Printing Pads, to Remove Aniline Ink from.—Saturate a sponge in water as hot as possible to bear the hand in, pass the wet sponge across the face of the pad and the ink will disappear. Then rinse off the face with the sponge dipped in cold water. Experience has also taught that when the print begins to get dim, if you will dampen the face of the pad with a sponge dipped in cold water, the ink becomes as bright as at first, and in this way a much larger number of letters may be pulled than if this process is not employed.

Printers' Ink, to Remove.—1. Place a thick pad of white blotting paper beneath the sheet of paper which is soiled. Then apply sulphuric ether with cotton wool, gently rubbing. Finally apply white blotting paper to absorb the color. Continue the application of fresh ether and repeat until all stains disappear. Do this away from a light.

2. Printers' ink is soluble in ether, oil of turpentine, and benzine. Washing with warm caustic lyes is also recommended.

3. This is not an easy matter. It is said, however, that it can be accomplished to a limited extent by means of ether or a solution of soap in water, naphtha, benzol, hot solutions in water of potassium or sodium hydroxide (caustic potash or soda).

Ink, to Preserve.—To Prevent Moulding of.—1. Mouldiness in ink may be prevented by adding a little oil of cloves or a few drops of creosote.

2. A small quantity of salicylic acid, ½ grm. to the liter, will prevent it from moulding even when kept in open ink bottles. This is far preferable to the bad smelling carbolic acid or the very poisonous bichloride of mercury, so frequently used both in ink and mucilage to prevent souring, fermentation or mould.

3. Add a small quantity of a solution of creosote in pyroligneous acid or rectified spirit. A clove placed in the ink will keep it twenty years.

4. Add a few drops of carbolic acid and clove oil to each pint bottle.

Purple.—1. To a decoction of 12 parts Campeachy wood in 120 parts water, add 1 part subacetate of copper, 14 parts alum, and 4 parts gum arabic; let stand for four to five days.

2. To a strong decoction of logwood add a little alum or chloride of tin.

Red and Carmine Inks.—1. Genuine carmine ink is made by placing 15 to 20 grn. carmine in 3 oz. water, and then to add so much strong

liquid ammonia, drop by drop, till all the carmine is dissolved; then add 20 grn. powdered gum arabic. If you want a cheaper ink, substitute droplake for the carmine; but it is not so beautiful.

2. Buchner's Carmine Ink.—Pure carmine, 12 grn.; water of ammonia, 3 oz.; dissolve, then add powdered gum, 18 grn.; ½ drm. powdered drop lake may be substituted for the carmine where expense is an object.

3. Use 220 grn. best carmine, 1 oz. caustic ammonia, then add 7 grn. finely powdered white gum arabic; shake until the gum is th roughly dissolved.

4. Half a drachm of powdered drop lake and 18 grn. powdered gum arabic, dissolved in 3 oz. ammonia water, makes one of the finest red or carmine inks.

5. Brazil wood, 2 oz.; muriate of tin, ½ drm; gum arabic, 1 drm.; boil down in 32 oz. water to one half and strain,

6. The following recipe for a beautiful red ink is given by Metra, of Paris: Dissolve 25 parts, by weight, of saffranin in 500 parts warm glycerine, then stir in carefully 500 parts alcohol and an equal quantity of acetic acid. It is then diluted with 9,000 parts water, in which is dissolved a little gum arabic.

7. Use ¼ lb. Brazil wood, ⅛ oz. gum arabic. ¼ oz. sugar and ¼ oz. alum. Add a little vinegar.

8. Red Ink, Durable. (Winckler's.)—Rub fine 6 parts red carmine with 75 parts liquid water glass. Dilute this mixture with 675 parts rain water. Let it stand a few days, and pour off the fluid.

9. Böttger rubs up carmine and silicate of soda, and then adds to this mixture a concentrated silicate solution till the whole is of sufficient consistency to write well. The product gives a very brilliant ink when dry, and dries quickly. It must be kept out of contact of air in a well closed vessel.

10. Dissolve 20 gr. pure carmine in 3 fl. oz. liquid ammonia; add 18 gr. powdered gum.

11. Best ground Brazil wood, 2 oz.; diluted acetic acid, ½ pt.; alum, ¼ oz. Boil them slowly in an enameled vessel for half an hour, strain and add ½ oz. gum.

12. One quart white wine vinegar, 2 oz. Brazil wood and ½ oz. alum, bottled and well shaken, for a fortnight; then let simmer in a saucepan, and add ¾ oz. gum arabic. Let the whole stand for a few days, filter and it will be ready for use.

13. Boil 4 oz. Pernambuco wood with 16 oz. dilute acetic acid and an equal quantity of water, until 24 oz. remain. Add 1 oz. alum and evaporate again to 16 oz.; add gum arabic, 1 oz. and strain; and lastly, add to the cold liquid 1 dr. protochloride of tin.

14. Triturate in a porcelain mortar 3 drm. best crystallized water soluble roseine and dissolve it in boiling distilled water, in the last portions of which 2 oz. gum arabic has been dissolved. The amount of water depends on the tint which it is desired to produce.

N. B.—Roseine is acetate of rosaniline; the hydrochlorate of rosaniline is known as fuchsine. In place of roseine, eosine (or tribrom fluorescine) may be used, which gives a magnificent yellow-red tint.

15. Four ounces ground Brazil wood and 3 pt. vinegar, boiled till reduced to 1½ pt., and 3 oz. powdered rock alum added.

16. One quarter pound raspings of Brazil wood infused in vinegar for 2 to 3 days; boil the infusion for 1 hour over a gentle fire and filter while hot; put it again on the fire and dissolve in it first, ½ oz. gum arabic, then ½ oz. alum and white sugar.

17. Crimson Writing Fluid.—Powdered cochineal, 1 oz.; hot water, ½ pt. Digest, and when quite cold add ammonia, 1 oz., diluted with 3 or 4 oz. water. Macerate for a few days and decant when clear.

Resin Oil Ink.—Resin oil, 1½ lb.; resin, 19½ oz.; soft soap, 2¼ oz. Melt together. Add lampblack when cold.

Ruling Inks.—Red, for Ruling.—One pound Brazil wood to 1 gal. best vinegar; let the vinegar simmer before you add the wood, then let them simmer together for half an hour, then add ¾ lb. alum to set the color; strain it through a woolen or cotton cloth, cork it tight in a stone or glass bottle. For ruling, add ½ gill fresh gall to 1 qt. red ink, then cork it up in a bottle for use.

Ink to Rule Faint Lines.—Dissolve in a small quantity of warm water, 20 parts Prussian blue by the aid of 3 parts potassium ferrocyanide, and dilute the solution with thin gum water until the proper degree of color is obtained.

See also *black* ink above,

Shoemaker's Ink.—Dissolve an equal quantity each of copperas and gum arabic in a small quantity of boiling water and add a very little extract of logwood to the solution. If it gums, dilute it a little with hot water. Concentrated solution of shellac in hot aqueous solution of borax is sometimes used in place of a portion of the gum.

Show Card Ink.—

Pure asphaltum	16 oz.
Venice turpentine	18 oz.
Lampblack	4 oz.
Spirit of turpentine	2 qt.

Dissolve and mix thoroughly.

Silver, to Write on with a Permanent Black.—Take burnt lead and pulverize it. Incorporate it next with sulphur and vinegar, to the consistency of a paint, and write with it on any silver plate. Let it dry, then present it to the fire so as to heat the work a little, and it is completed.

To Write in Silver.—Finest pewter or block tin, 1½ oz.; quicksilver, 3 oz. Mix until both become fluid, grind with gum water and write with it. The writing will appear as if done with silver.

Silver Ink.—1. For silver ink the process is the same as for gold, substituting silver leaf for the gold leaf. See *Gold Ink* above. Then treat as follows:

In consequence of the beating between gold beaters' skin, it has particles of grease and other impurities attached to it which must be removed before it can be used for ink. For this purpose the whole sheets, or the commercial bronze powder, are triturated with a little honey to a thin magma on a glass or porphyry plate with a pestle, as carefully as possible, as the beauty of the ink depends essentially on this. The finely rubbed paste is rinsed into a thin glass beaker, boiled for a long time with water containing a little alkali, frequently stirred, decanted, well washed with hot water and dried at a gentle heat. By boiling this powder with water containing sulphuric, nitric, or hydrochloric acid, different shades can be imparted to it.

Next, a solution of 1 part of white gum arabic in 4 parts of distilled water is mixed with 1 part of potash water glass and triturated with the requisite quantity of purified metallic powder. Gold ink will bear more liquid then silver ink, since gold covers much better; on rough paper more metal is necessary than on sized paper; on light paper more than on dark, to make the color of the ink appear equally intense.

In general 1 part of foil is enough for 3 or 4 parts of the above liquid. In preparing large quantities of ink a low porcelain measure is used for transferring it to the small glass vessels where it is to be kept, and it must be continually and thoroughly stirred, so that it will always keep well mixed. It requires frequent stirring also when in use. It is best to mix the dry powder with the liquid immediately before using. The ink can be used with a common steel pen and flows very well when writing slowly, but it is better to use a pencil.

I consider the use of potash water glass of great importance. It greatly increases the metallic luster on paper, prevents its looking dead, protects the writing from being discolored by the action of the atmosphere, and also prevents its penetrating too far into the pores of the paper, without rendering it very viscid. Although the writing of itself possesses a high metallic luster, it may be increased by gently polishing with a polishing steel. Inks made with mosaic gold, mosaic silver, iodide of lead, etc., are not nearly so beautiful.—*C. H. Viedt.*

2. Mix 1 oz. finest block tin in shavings with 2 oz. mercury till they become perfectly amalgamated. Then shake up in a stoppered bottle with enough gum water to give proper consistence. The writing, when dry, will have the appearance of silver.

Liquid Silver for Vellum.—Grind silver leaf with gum water, or white of egg.

Solid Inks. (Roy.)—Various qualities of inks are prepared in powder. By placing a small quantity of this powder in water, ink for writing is immediately obtained. One variety styled indelible ink is stated to resist the most energetic chemical reagents. It appears to consist mainly of charcoal and glycerine.

Steel, Ink for Writing on, or Tin Plates, or Sheet Zinc.—1. Mix 1 oz. of powdered sulphate of copper and ½ oz. of powdered sal ammoniac with 2 oz. of diluted acetic acid, adding lampblack or vermilion.

2. Dissolve 1 part of copper in 10 parts of nitric acid, and dilute with 10 parts of water.

Stencil Ink.—1. Take of shellac, 2 oz.; borax, 2 oz.; water, 25 oz.; gum arabic, 2 oz., and of Venetian red a sufficiency. Boil the borax, shellac and some water until they are dissolved; add the gum arabic and withdraw from the fire. When the solution has become cold complete 25 oz. with water, and add more red to bring it to a suitable consistency.

2. Eight oz. mastic in tears, 12 oz. shellac, 1 oz. Venice turpentine; melt together, add 1 lb. wax, 6 oz. tallow; when dissolved add 6 oz. hard soap shavings (tallow soap) and mix, then add coloring matter, such as lampblack, Prussian blue, vermilion or carmine, chrome green or white lead or other pigment. The cake should be brittle.

3. Stencil Ink for Wood.—An excellent stencil ink for boxes and packing cases can be made by mixing lampblack, fine clay and gum arabic together. The lampblack gives the color, the clay furnishes a body and the gum an adhesive. Water will answer as a solvent, but lampblack is so light that a few drops of vinegar or other acid will facilitate its admixture with the other ingredients. Any good adhesive substance, such as dextrine or gum tragacanth, may be found to answer as well as gum arabic to bind the mixture.

4. Colored Stencil Ink.-Shellac, 4 parts; borax, 1 part; dissolve in a small quantity of boiling water and dilute with hot water to the consistency of very thin sirup; to this add a sufficient quantity of logwood, or Brazil wood extract, or soluble coal tar reds, for red. For blue add to the lac solution soluble Prussian blue or blue carmine.

Fabrics, Removal of Stains from. See also **Cleansing.**—1. To remove ordinary ink (tannogallate of iron) stains, the following treatment is recommended: In many cases lemon juice will often prove efficacious.

2. If this fails, try an aqueous solution of oxalic acid, 1 part to 2 parts water, and rub well with a soft cloth.

3. Or use a solution of chloride of tin, 1 part to 3 parts water, or pure dilute muriatic acid, 1 part to 10 parts water. Apply with a camel's hair brush and then wash in cold water.

4. Where the colors of the fabric are affected by the above treatment, moisten the spots with fresh milk and cover with fine salt. This should be done before washing.

5. If the fabric is fine and delicate, the stained portions may be dipped in melted tallow and then pressed for some time between layers of warm pipe clay.

6. Stains of indelible ink, made from nitrate of silver, may be removed by moistening them with a brush dipped in a strong aqueous solution of cyanide of potassium, and then well washing the fabric in water. The cyanide solution is very poisonous.

7. Boettger recommends pyrophosphate of soda for the removal of ink stains from colored textiles.

8. Try a mixture of 2 parts cream of tartar and 1 part of powdered alum.

9. Tartaric acid is also recommended.

10. Oxalic acid can also be used, but is not recommended, as it is liable to destroy the fibers of the cloth.

11. The *Journal de Pharmacie d'Anvers* recommends pyrophosphate of soda for the removal of ink stains. This salt does not injure vegetable fiber and yields colorless compounds with the ferric oxide of the ink. It is best to first apply tallow to the ink spot, then wash in a solution of pyrophosphate until both tallow and ink have disappeared.

12. Stains of red aniline ink may be removed by moistening the spot with strong alcohol acidulated with nitric acid. Unless the stain is produced by eosine, it disappears without difficulty. Paper is hardly affected by the process; still it is always advisable to make a blank experiment first.

13. Marking Ink.—Dissolve 1 oz. cyanide of potassium in 4 oz. water; this mixture is very poisonous, and should therefore be used with great caution. Moisten the stained part of the garment with this solution by dipping it into it, or by means of a small brush, and in a few hours the stain will be obliterated.

14. To a solution of strong cyanide of potassium add a few grains of iodine. Repeated applications will remove any stain caused by nitrate of silver.

15. Grimm, in the *Polytechnisches Notizblatt*, proposes the following method for removing indelible ink and other silver stains without the use of cyanide of potassium. Chloride of copper is first applied to the tissue; it is next washed with hyposulphite of soda solution, and afterward with water. It is said that this may be employed on colored woven cotton tissues. For white cottons and linens dilute solutions of permanganate of potash and hydrochloric acid, followed by the hyposulphite of soda and clear water are preferable. For cleaning the hands, iodine dissolved either with iodide of potassium, or in alcohol, is used, followed by aqua ammonia.

16. Wet with chloride of lime and afterward rinse in a little ammonia or sodium of hyposulphite.

17. Rub with tincture of iodine, then wash with ammonia.

18. India Ink on Clothing.—India ink cannot be removed by any chemical means, as it is composed of minute parts of carbon held in suspension by water. Some of the ink may be removed by sponging.

19. Ink Stains, to Remove from Wood.—Mix 1 lb. of sulphuric acid and 2 qt. water. Apply to the stain after scouring with sand.

20. Ink Stains, to Remove from Hands.—Use ammonia water, muriatic acid, and plenty of water alternately, assisted by pumice stone, if necessary.

21. To Remove from Paper.—Take of chloride of lime 1 lb., thoroughly pulverized, and 4 qt. soft water. The above must be thoroughly shaken when first put together. It is required to stand twenty-four hours, to dissolve the chloride of lime; then strain through a cotton cloth, after which add a teaspoonful of acetic acid (No. 8 commercial) to every ounce of the chloride of lime water. The eraser is used by reversing the penholder in the hand, dipping

the end of the penholder in the fluid, and applying it, without rubbing, to the word, figure or blot required to be erased. When the ink has disappeared, absorb the fluid with a blotter.

Stamp Inks for Rubber Stamps.—The usual rubber stamp inks are prepared with water soluble aniline colors and glycerine. A good formula, which we have tested practically, is given by Dieterich.

1. Blue Rubber Stamp Ink:

Aniline blue, water sol., 1 B....	3 parts.
Distilled water	10 parts.
Pyroligneous acid.....	10 parts.
Alcohol	10 parts.
Glycerine	70 parts.

Mix them intimately by trituration in a mortar. [The blue should be well rubbed down with the water, and the glycerine gradually added. When solution is effected the other ingredients are added.]

Other colors are produced by substituting for the blue any one of the following:

2. Methyl violet, 3 B.....	3 parts.
3. Diamond fuchsin I	2 parts.
4. Methyl green, yellowish.....	4 parts.
5. Vesuvin B (brown).....	5 parts.
6. Nigrosin W (blue black).....	4 parts.

7. If a bright red ink is required, 3 parts of eosin BBN are used, but the pyroligneous acid must be omitted, as this would destroy the eosin. Other aniline colors, when used for stamping ink, require to be acidulated.—*American Druggist.*

8. The ordinary stamping ink made by diluting printing ink (which is made of lampblack and linseed varnish) with boiled linseed oil, stands pretty well if enough is used, but when poorly stamped will wash off. Dr. W. Reissig, of Munich, has recently made an ink for canceling stamps, which is totally indelible, and the least trace of it can be detected chemically. It consists of 16 parts of boiled linseed oil varnish, 6 parts of the finest lampblack, and 2 to 5 parts of iron perchloride. Diluted with ⅛ the quantity of boiled oil varnish, it can be used for a stamp. Of course it can only be used with rubber stamps, for metallic type would be destroyed by the chlorine in the ink. To aviod this, the perchloride of iron may be disolved in absolute alcohol, and enough pulverized metallic iron added to reduce it to the protochloride which is rapidly dried and added to the ink. Instead of the chloride, other salts of protoxide or peroxide of iron can be used. The iron unites with the cellulose and the sizing of the paper, so that it can easily be detected even after the ink has all been washed off. Sulphide of ammonia is well adapted for its detection.

9. A violet ink for rubber stamps is made by mixing and dissolving 2 to 4 drm. aniline violet, 15 oz. alcohol, and 15 oz. glycerine. The solution is poured on the cushion and rubbed in with a brush.

10. The following is said to be a good ink for use with rubber stamps: Aniline violet, 90 grn.; boiling rain water, 1 oz.; to which is added a little glycerine and a small quantity of molasses. The quantities of the last two ingredients will vary with the season, but half a teaspoonful will be ample for the quantities of violet and water specified.

11. Red.—Dissolve ¼ oz. of carmine in 2 oz. of strong water of ammonia and add 1 dr. of glycerine and ¾ oz. of dextrine.

12. Blue.—Rub 1 oz. of Prussian blue with enough water to make a perfectly smooth paste; then add 1 oz. of dextrine, incorporate it well, and finally add sufficient water to bring it to the proper consistence.

13. For Linen and Cotton.—Dissolve 1 part of asphaltum in 4 parts of oil of turpentine and add lampblack or blacklead, in fine powder, in sufficient quantity to render the ink of a proper consistence for printing with types.

14. Rubber Stamp Color.—(Bœttger.)—Bleu de Lyons is dissolved to saturation with the aid of heat in concentrated glycerine, some Thenard's blue added, and the liquid thickened with finely powdered gum arabic.

Steel Pens, Inks which do not Corrode.—1. Ink which does not corrode steel pens (Haenle's). Boil 125 parts of pulverized gallnuts, 62½ parts of gum, and 62½ parts sulphuric acid, in 2,000 parts of distilled or rain water, add a few grains of chloride of mercury.

2. Runge's.—Two hundred and fifty parts decoction of logwood and ¼ part of yellow chromate of potash. To prevent the ink from becoming too thick add a few drops of solution of chloride of mercury.

3. Schmidt's.—Two oz. calcined iron sulphate, 3 oz. gallnuts, 1 oz. vegetable gum. Digest in 1 qt. distilled water.

Stone or Marble, Ink for.—Trinidad asphaltum and oil of turpentine, equal parts. This is used in a melted state for filling in letters cut on tombstones, marble slabs and monuments, and is very durable.

Sympathetic Inks.—Inks which favor secret correspondence. They are very interesting from a chemical point of view.

The solutions used should be so nearly colorless that the writing cannot be seen till the agent is applied to render it visible.

Inks that Appear Through Heat.

1. Write with a concentrated solution of caustic potash. The writing will appear when the paper is submitted to strong heat.

2. Write with a solution of hydrochlorate of ammonia, in the proportion of 15 parts to 100. The writing will appear when the paper is heated by holding it over a stove, or by passing a hot smoothing iron over it.

3. A weak solution of nitrate of copper gives an invisible writing, which becomes red through heat.

4. A very dilute solution of perchloride of copper gives invisible characters that become yellow through heat.

5. A slightly alcoholic solution of bromide of copper gives perfectly invisible characters which are made apparent by a gentle heat, and which disappear again through cold.

6. Write upon rose colored paper with a solution of chloride of cobalt. The invisible writing will become blue through heat and will disappear on cooling.

7. Write with a solution of sulphuric acid. The characters will appear in black through heat. This ink has the disadvantage of destroying the paper.

8. Write with lemon, onion, leek, cabbage, or artichoke juice. Characters written with these juices become very visible when the paper is heated.

9. Digest 1 oz. of zaffre, or oxide of cobalt, at a gentle heat, with 4 oz. of nitromuriatic acid till no more is dissolved, then add 1 oz. common salt and 16 oz. of water. If this be written with and the paper held to the fire, the writing becomes green, unless the cobalt should be quite pure, in which case it will be blue. The addition of a little nitrate of iron will then impart the property of becoming green. It is used in chemical landscapes for the foliage.

10. Put in a vial ½ oz. of distilled water, 1 drm. of bromide of potassium, and 1 drm. of pure sulphate of copper. The solution is nearly colorless, but becomes brown when heated.

11. Nitrate of nickel and chloride of nickel in weak solution form an invisible ink, which becomes green by heating, when the salt contains traces of cobalt, which usually is the case; when pure, it becomes yellow

12. When the solution of acetate of protoxide of cobalt contains nickel or iron, the writing made by it will become green when heated; when it is pure and free from these metals, it becomes blue.

13. Milk makes a good invisible ink, and buttermilk answers the purpose better. It will not show if written with a clean new pen, and

ironing with a hot flat iron is the best way of showing it up. All invisible inks will show on glazed paper; therefore unglazed paper should be used.

14. Burn flax so that it may be rather smouldered than burned to ashes, then grind it with a muller on a stone, putting a little alcohol to it, then mix it with a little weak gum water, and what you write, though it seem fair, may be rubbed or washed out.

15. Boil oxide of cobalt in acetic acid. If a little common salt be added, the writing becomes green when heated, but with niter it becomes a pale rose color.

16. A weak solution of nitrate of mercury becomes black by heat.

Inks that Appear under the Influence of Light.

17. Chloride of gold serves for forming characters that appear only as long as the paper is exposed to daylight, say for an hour at least.

18. Write with a solution made by dissolving one part of nitrate of silver in 1,000 parts of distilled water. When submitted to daylight, the writing appears of a slate color or tawny brown.

Inks Appearing Through Reagents.

19. If writing be done with a solution of acetate of lead in distilled water, the characters will appear in black upon passing a solution of an alkaline sulphuret over the paper.

20. Characters written with a very weak solution of chloride of gold will become dark brown upon passing a solution of perchloride of tin over them.

21. Characters written with a solution of gallic acid in water will become black through a solution of sulphate of iron, and brown through the alkalies.

22. Upon writing on paper that contains but little sizing with a very clear solution of starch, and submitting the dry characters to the vapor of iodine, or passing over them a weak solution of iodide of potassium, the writing becomes blue, and disappears under the action of a solution of hyposulphite of soda in the proportions of 1 to 1,000.

23. Characters written with a 10% solution of nitrate of protoxide of mercury become black when the paper is moistened with liquid ammonia, orange red with a solution of, and gray through heat.

24. Characters written with a weak solution of the soluble chloride of platinum or iridium become black when the paper is submitted to mercurial vapor. This ink may be used for marking linen. It is indelible.—*Les Inventions Nouvelles.*

25. C. Widemann communicates a new method of making an invisible ink to *Die Natur.* To make the writing or the drawing appear which has been made upon paper with the ink, it is sufficient to dip it into water. On drying the traces disappear again, and reappear by each succeeding immersion. The ink is made by intimately mixing linseed oil, 1 part; water of ammonia, 20 parts; water, 100 parts. The mixture must be agitated each time before the pen is dipped into it, as a little of the oil may separate and float on top, which would, of course, leave an oily stain upon the paper.

26. Write with a solution of ferrocyanide of potassium; develop by pressing over the dry invisible characters a piece of blotting paper moistened with a solution of copper sulphate or of copperas.

27. Write with pure dilute tincture of iron; develop with a blotter moistened with strong tea.

28. Writing with iodide of potash and starch becomes blue by the least trace of acid vapors in the atmosphere, or by the presence of ozone. To make it, boil starch, and add a small quantity of iodide of potassium in solution.

29. Sulphate of copper in very dilute solution will produce an invisible writing, which will turn light blue by vapors of ammonia.

30. Soluble compounds of antimony will become red by sulphide of hydrogen vapor.

31. Soluble compounds of arsenic and of peroxide of tin will become yellow by the same vapor.

32. An acid solution of chloride of iron is diluted till the writing is invisible when dry. This writing has the remarkable property of becoming red by sulphocyanide vapors (arising from the action of sulphuric acid on sulphocyanide of potassium in a long necked flask), and it disappears by ammonia, and may alternately be made to appear and disappear by these two vapors.

33. Writing executed with rice water is visible when dry, but the characters become blue by the application of iodine. This ink was much employed during the Indian mutiny.

34. Write with a solution of paraffin in benzol. When the solvent has evaporated, the paraffin is invisible, but becomes visible on being dusted with lampblack or powdered graphite, or smoking over a candle flame.

35. To Write Black Characters with Water.—Mix 10 parts nutgalls, 2½ parts calcined sulphate of iron. Dry thoroughly, and reduce to fine powder. Rub this powder over the surface of the paper, and force into the pores by powerful pressure, brush off the loose powder. A pen dipped in water will write black on paper thus treated.

36. To Write Blue Characters with Water.—Mix sesquisulphate of iron and ferrocyanide of potassium. Prepare the paper in the same manner as for writing black characters with water. Write with water and the characters will appear blue.

37. To Produce Brown Writing with Water.—Mix sulphate of copper and ferrocyanide of potassium. Prepare the paper in the same manner as before. The charaters written with water will be reddish brown.

38. There is a well known proprietary article sold in Paris under the name of "Encre pour les Dames" (ink for ladies). Hager, in a recent scientific journal, states that this consists of an aqueous solution of iodide of starch, and is specially intended for love letters. In four weeks characters written with it disappear, preventing all abuse of letters, and doing away with all documentary evidence of any kind in the hands of the recipient. The signers of bills of exchange who use this ink are of course freed from all obligations in the same length of time. Of course this is criminal.

39. Vanishing Ink.—To make an ink, black at the time of writing, but which will disappear after a short time, boil nutgalls in alcohol, put copper sulphate and sal ammoniac to it, and when cold dissolve a little gum in it. Writing done with this ink will vanish in twenty-four hours. No. 38 preferable.

40. Invisible.

Linseed oil	1 part.
Liquor ammonia	20 parts.
Water	100 parts.

The mixture is well shaken before the pen is dipped into it, as otherwise the little oil which separates causes an oily mark on the paper. To render the writing legible, the paper is dipped into water, the characters again disappearing when the paper dries. See 25.

Transfer Ink.—For the manufacture of the following inks an iron pot and lid must be procured. Then take as follows:

Stone Writing Ink.—Virgin wax, 4 parts; tallow, 3 parts; soap, 13 parts; shellac, 6 parts; lampblack, 3 parts.

Transfer Writing Ink.—Virgin wax, 2 parts; white soap, 1 part; shellac, 1 part; lampblack, ½ part.

Chalks.—Virgin wax, 16 parts; tallow, 2 parts; white soap, 12 parts; lampblack, 3½ parts.

Manipulation of Writing Ink and Chalks.—Melt the wax and tallow and mix with an iron

spoon; then add the soap, which must be previously cut into strips, and when melted apply a light, and allow to burn until the whole is decreased to the same bulk as existed before the addition of the soap. The shellac is now to be carefully added, bit by bit, stirring the whole time to effect perfect amalgamation. The black is next to be added, and the whole well mixed while in a liquid state; then poured into a mould, or on a slab, and cut to the required size while warm. The same method of proceeding is alike applicable to the manufacture of transfer writing ink, proceeding with the wax only, there being no tallow.

Retransfer Inks.—Stone Retransfer Ink.—Litho. printing ink, 2 parts; writing ink, 2 parts; thin varnish, 2 parts; tallow, ½ part.

Copperplate Transfer Ink.—Litho. writing ink, 4 parts; thin varnish, 1 part; wax, 1 part; tallow, ½ part; soap, 1 part. Carefully melt the ingredients, and when in a liquid state pour into moulds, or cut to the required size.

Terra-Cotta, Ink for Sketching on.—Try Brunswick or Japan black. Thin with a little turpentine if necessary.

Ink, to Keep from Thickening.—Keep the ink from the air, as it not only evaporates, but also oxidizes it, and renders it thick.

Tin, Ink for Writing on.—1. Nitric acid, 12½ parts; copper, 1¼ parts; add water, 12½ parts. Clean the tin with dry whiting; write with a quill.

2. Mix verdigris, 1 part; sal ammoniac, 1 part; chimney black, ½ part; water, 10 parts; to be well shaken in a bottle (and labeled poison). To be used with a quill pen.

Typewriter Ribbons.—Take vaseline (petrolatum) of high boiling point, melt it on a water bath or slow fire, and incorporate by constant stirring as much lampblack or powdered drop black as it will take up without becoming granular. If the fat remains in excess the print is liable to have a greasy outline; if the color is in excess the print will not be clear. Remove the mixture from the fire, and while it is cooling mix equal parts of petroleum, benzine and rectified oil of turpentine, in which dissolve the fatty ink, introduced in small portions by constant agitation. The volatile solvents should be in such quantity that the fluid ink is of the consistence of fresh oil paint. One secret of success lies in the proper application of the ink to the ribbon. Wind the ribbon on a piece of cardboard, spread on a table several layers of newspaper, then unwind the ribbon in such lengths as may be most convenient, and lay it flat on the paper. Apply the ink, after agitation, by means of a soft brush, and rub it well into the interstices of the ribbon with a tooth brush. Hardly any ink should remain visible on the surface. For colored inks use Prussian blue, red lead, etc., and especially the aniline colors.

Aniline black	½ oz.
Pure alcohol	15 oz.
Concentrated glycerine	15 oz.

Dissolve the aniline black in the alcohol, and add the glycerine. Ink as before.

Vanadium Ink.—This is for an ink which is permanent and unaffected by the application of acids, alkalies, etc., and which renders forgeries and erasures, additions or alterations easy of detection and difficult to accomplish. To carbon black (preferably prepared by the action of concentrated sulphuric or other acid on sugar) are added a solution of gum arabic or other mucilage, caustic soda, oxalic acid and Indian ink. Vanadium in any form, Aleppo galls, nutgalls, and a small quantity of an aniline dye are then added, along with sufficient water to make the ink flow readily. The following proportions yield good results: Nutgalls, 20%; Aleppo galls, 5%; carbon black, 10%; vanadium, 1%; Indian ink, 10%; oxalic acid, 3%; aniline dye, 1%: rain water, 50%. The whole is boiled, filtered and strained.

Vegetable Ink.—Experiments are being made to acclimatize in Europe the *Coriaria thymifolia*, or ink plant of New Grenada. The juice of this plant, locally termed chanchi, is at first of somewhat a reddish color, but becomes intensely black in a few hours. This juice can be used for writing without requiring any further preparations; it corrodes steel pens less than ordinary ink, and has, moreover, the advantage of better resisting chemical agents. When the portion of America named above was under Spanish dominion, all public documents were written with chanchi, which was not removed from paper by sea water.

Violet.—1. One and one sixth oz. of so-called primula violet is dissolved in 3 qt. boiling distilled water. This may be converted into a copying ink by adding 4 oz. sugar, 4 oz. glycerine and 10 oz. of gum arabic.

N. B.—Primula violet is known also as dahlia, or Hofmann's violet, of which there exist a number of different shades. Perhaps the finest is that known as No. 6. This coloring matter consist of salts of trimethylrosaniline, and triethylrosaniline.

Other tints may be prepared from other aniline colors.

It is best to add to the solution of an aniline color a small percentage (3 to 5 per cent.) of alcohol, and also of glycerine (1 to 4 per cent.—*Monthly Mag. of Pharmacy.*

[On this receipt we would remark that gum arabic is simply a mischieveus addition which deprives aniline inks of their most valuable properties, *i. e.*, their perfect limpidity, their leaving no deposit on the pen, and their instantaneous drying. Cornflower blue is another name for pittacal, and is perfectly distinct from soluble Paris blue.]

2. Boil 8 oz. logwood in 3 pt. water till reduced to 1½ pt. Strain, and add 1½ oz. gum and 2½ oz. alum.

3. Cudbear, 1 oz.; pearlash, 1½ oz.; hot water, 1 pt. Allow to stand for twelve hours; strain and add about 2 oz. gum. If required to keep, add 1 oz. spirits of wine.

4. Water, 2,000 parts; alum, 10¼ parts; logwood, 250 parts; gum arabic, 10¼ parts; sugar, 5¼ parts. Boil for one hour. Let the mixture stand two or three days, then strain through linen. Improved by age.

White Ink.—1. Triturate together 1 part of honey and 2 parts dry ammonia alum. Dry thoroughly and calcine in a shallow dish over the fire to whiteness. Cool, wash and rub up with enough gum water to use.

2. Fine French zinc white, or white lead, rubbed up with gum water to the proper consistency.

3. Mix pure freshly precipitated barium sulphate, or flake white, with water containing enough gum arabic to prevent the immediate settling of the substance. Starch or magnesium carbonate may be used in a similar way. They must be reduced to impalpable powders.

4. White Ink for Blue Paper.—Use oxalic acid and water. This bleaches the paper, leaving white lines.

To Make New Writing Look Old.—Infuse ½ drm. saffron with ¼ pt. ink. Warm it gently. It will cause whatever is written with it to turn yellow, and give it an appearance of age.

Faded Writing, Restoration of.—Moisten the paper a little with water, and brush over it a solution of sulph-hydric ammonia. Since most inks contain iron, it is easy to understand that there will be formed sulphide of iron, which is black.

Yellow Ink.—1. Coarsely powdered gamboge, 1 oz.; hot water, 5 oz.; dissolve, and when cold add of spirit, ¾ oz.

2. Boil ½ lb. French berries and 1 oz. alum in 1 qt. rain water for half an hour, or longer; then strain and dissolve in 1 oz. hot liquor of gum arabic.

3. One part fine orpiment, well rubbed up, with 4 parts thick gum water.

Ink for Zinc Labels—1. Take 1 drm. verdigris, 1 drm. sal ammoniac powder, and ½ drm. lamp black, and mix them with 10 drm. water. This will form an indelible ink for writing on zinc.

2. Ammonium chloride, 6 parts; verdigris, 6 parts; lampblack, 3 parts; water, 50 parts.

3. Ink for Writing on Zinc. Dietrich gives the following as a reliable formula:

	Parts.
Chloride of potassium	3
Sulphate of copper	6
Distilled water	70

Dissolve, and mix with the following:

Aniline blue (water soluble)	½₀
Dilute acetic acid	5
Distilled water	20

4. An ink composed of copper, 1 part, dissolved in 10 parts nitric acid, 10 parts water being afterward added, is useful for marking on tin or zinc plant labels.

5. Permanent Ink for Writing in Relief on Zinc.—Bichloride of platinum, dry, 1 part; gum arabic, 1 part; distilled water, 10 parts. The letters traced upon zinc with this solution turn black immediately. The black characters resist the action of weak acids or of rain, and the liquid is thus adapted for marking signs, labels, or tags which are liable to exposure. To bring out the letters in relief, immerse the zinc tag in a weak acid for a few minutes. The writing is not attacked, while the metal is dissolved away.

Insecticides.—1. Kerosene Emulsion.—One of the most satisfactory formulas is as follows:

Kerosene	2 gal.	67%
Common soap or whale oil soap	½ lb.	33%
Water	1 gal.	

Heat the solution of soap and add it boiling hot to the kerosene. Churn the mixture by means of a force pump and spray nozzle for five or ten minutes. The emulsion, if perfect, forms a cream which thickens upon cooling and should adhere without oiliness to the surface of glass. For use against scale insects dilute 1 part of the emulsion with 9 parts of water. For most other insects dilute 1 part of the emulsion with 15 parts of water. For soft insects like plant lice the dilution may be carried to from 20 to 25 parts of water.

2. The milk emulsion is produced by the same methods as the above.

3. The Resin Washes.—These insecticides act by contact, and also, in the case of scale insects, by forming an impervious coating which effectually smothers the insects treated. These resin washes vary in efficacy according to the insect treated. Experience has shown that the best formula for the red scale (*Aonidia aurantii* Maskell) and its yellow variety (*A. citrinus* Coquillett) is as follows:

Resin	18 lb.
Caustic soda (70% strength)	5 lb.
Fish oil	2½ pt.
Water to make	100 gals.

The necessary ingredients are placed in a kettle and a sufficient quantity of cold water added to cover them; they are then boiled until dissolved, being occasionally stirred in the meantime, and after the materials are dissolved the boiling should be continued about an hour, and a considerable degree of heat should be employed, so as to keep the preparation in a brisk state of ebullition, cold water being added in small quantities whenever there are indications of the preparation boiling over. Too much cold water, however, should not be added at one time, or the boiling process will be arrested and thereby delayed, but by a little practice the operator will learn how much water to add so as to keep the preparation boiling actively. Stirring the preparation is quite unnecessary during this stage of the work. When boiled sufficiently it will assimilate perfectly with water, and should then be diluted with the proper quantity of cold water, adding it slowly at first and stirring occasionally during the process. The undiluted preparation is pale yellowish in color, but by the addition of water it becomes a very dark brown. Before being sprayed on the trees it should be strained through a fine wire sieve, or through a piece of Swiss muslin, and this is usually accomplished when pouring the liquid into the spraying tank, by means of a strainer placed over the opening through which the preparation is introduced into the tank.

The preparing of this compound will be greatly accelerated if the resin and caustic soda are first pulverized before being placed in the boiler, but this is quite a difficult task to perform. Both of these substances are put up in large cakes for the wholesale trade, the resin being in wooden barrels, each barrel containing a single cake weighing about 375 lb., while the caustic soda is put up in iron drums containing a single cake each, weighing about 800 lb. The soda is the most difficult to dissolve, but this could doubtless be obviated by first dissolving it in cold water and then using the solution as required. This insecticide may be applied at any time during the growing season.

4. A stronger wash is required for the San Jose scale (*Aspidiotus perniciosus* Comstock), and the following formula gives the best results:

Resin	30 lb.
Caustic soda (70%)	9 lb.
Fish oil	4½ pt.
Water enough to make	100 gals.

Place all the ingredients in a kettle and cover with water to a depth of 4 or 5 in., boil briskly for about two hours or until the compound can be perfectly dissolved with water. When this stage is reached the kettle should be filled up with water, care being taken not to chill the wash by adding large quantities of cold water at once. It may be thus diluted to about 40 gal., the additional water being added from time to time as it is used.

This preparation should only be applied during winter or during the dormant period. Applied in the growing season it will cause the loss of foliage and fruit.

In the application of both of these washes a very fine spray is not essential, as the object is not simply to wet the tree but to thoroughly coat it over with the compound, and this can be best accomplished by the use of a rather coarse spray, which can be thrown upon the tree with considerable force.

5. For Subterranean Insects.—Recent experiments have shown the practical value of the resin compounds against the grape phylloxera, and they will also be applicable to the apple root louse and other underground insects. The cheapest and at the same time one of the most satisfactory compounds experimented with is the following:

Caustic soda 77%	5 lb.
Resin	40 lb.
Water to make	50 gal.

Dissolve the soda over fire with 4 gal. of water, add the resin and after it is dissolved and while boiling add water slowly to make 50 gal. of compound. For use dilute in 500 gal. Excavate basins about the vines 6 in. deep and about 2 ft. in diameter and apply to each vine 5 gal. The results will be more satisfactory if the treatment is made early in the spring, so that the rain of the season will assist in disseminating the wash about the roots.

6. The kerosene emulsion made according to the formula given above is also applicable to certain underground insects in cases where it will not prove too expensive, as, for instance, the grape phylloxera or where white grubs are infesting a valuable lawn. It may then be used in the proportion of 1 part of the emulsion

to 15 gal. of water, applied liberally to the soil, and afterward washed down at frequent intervals with large quantities of water for several days. This can be done only where there is plenty of water at hand, but will be found of great value in special cases.

7. In other cases bisulphide of carbon may be used for specific and local underground forms. Nests of ants, for instance, may be destroyed by pouring 1 oz. of this substance into several holes, covering them with a wet blanket for ten minutes and afterward exploding the vapor at the mouth of the holes with a torch. Against onion, cabbage and radish maggots this substance may also be used by punching a hole with a sharp stick at the base of the plant and pouring in a teaspoonful of the liquid, covering afterward with earth.

8. The Arsenites — London Purple, Paris Green and White Arsenic.—These poisons are of the greatest service against all mandibulate insects, as larvæ and beetles, and they furnish the most satisfactory means of controlling most leaf feeders and the best wholesale remedy against the codling moth. Caution must be used in applying them on account of the liability of burning or scalding the foliage. The poisons should be thoroughly mixed with water at the rate of from 1 lb. to 100–250 gal. water, and applied with a force pump or hand spray nozzle. In preparing the wash it will be best to first mix the poison with a small quantity of water, making a thick batter, and then dilute the latter and add to the reservoir or spray tank, mixing the whole thoroughly.

9. When freshly mixed, either London purple or Paris green may be applied to apple, plum and other fruit trees except the peach, at the rate of 1 lb. to 150–200 gal., the latter amount being recommended for the plum, which is somewhat more susceptible to scalding than the apple. White arsenic does little if any injury at the rate of 1 lb. to 50 gal. of water. As shown by Mr. Gillette, however, when allowed to remain for some time (two weeks or more) in water, the white arsenic acts with wonderful energy, scalding, when used at the rate of 1 lb. to 100 gal., from 10% to 90% of the foliage. The action of the other arsenites remains practically the same, with, perhaps, a slight increase in the case of London purple.

10. With the peach these poisons, when applied alone, even at the rate of 1 lb. to 300 or more gallons of water, are injurious in their action, causing the loss of much of the foliage.

11. By the addition of a little lime to the mixture, London purple and Paris green may be safely applied at the rate of 1 lb. to 125 to 150 gal. of water, to the peach or the tenderest foliage, or in much greater strength to strong foliage, such as that of the apple or most shade trees.

12. Whenever, therefore, the application is made to tender foliage or when the treating with a strong mixture is desirable, lime water, milky, but not heavy enough to close the nozzle, should be added at the rate of about 2 gal. to 100 gal. of the poison. Pure arsenic, however, should never be used with lime, as the latter greatly increases its action.

13. With the apple, in spraying for the codling moth, at least two applications should be made—the first on the falling of the blossoms, the apples being about the size of peas, and the second a week or ten days later; but the poison should never be applied after the fruit turns down on the stem, on account of the danger of the poison collecting and remaining permanently in the stem cavity.—*Circular U. S. Depart. Agriculture.*

Insects, *to Destroy.*—Hot alum water destroys red and black ants, cockroaches, spiders and chintz bugs.

Formula for Insect Bites.—One of the very best applications for the bites of mosquitoes and fleas, also for other eruptions attended with intense itchings, is: Menthol in alcohol, one part to ten. This is very cooling and immediately effectual. It is also an excellent lotion for application to the forehead and temples in headache, often at once subduing the same.—*Weekly Med. Review.* See also **Bites.**

Insects, to Discover.—If the leaves of the plant turn reddish or yellow, or if they curl up, a close inspection will generally disclose that the plants are infested with a very small green insect, or else with the red spider, either of which must be destroyed. For this purpose, scald some common tobacco with water until the latter is colored to a yellow, and when cold sprinkle the leaves of the plants with it; but a better plan is to pass the stems and leaves of the plants between the fingers, and to then shake the plant and well water the bed immediately afterward. The latter operation destroys a large proportion of the insects shaken from the plant. This latter method is the only infallible one.

Insects, Expelling Them.—All insects dread pennyroyal; the smell of it destroys some and drives the others away. At the time that fresh pennyroyal cannot be gathered, get oil of pennyroyal; pour some into a saucer and steep in it small pieces of wadding or raw cotton and place them in corners, closet shelves, bureau drawers, boxes, etc., and the cockroaches, ants, or other insects will soon disappear. It is also well to place some between the mattrasses and around the bed. It is also a splendid thing for brushing off that terrible little insect, the seed tick.

Insects, and How to Fight Them.—Cut Worms.—Where cut worms are troublesome in the field, a very old and at the same time a very good remedy is to entrap them in holes made near the plants, or hills, if in the cornfield. An old rake handle, tapered at the end so as to make a smooth hole five or six inches deep, or more, will answer very well for this purpose. In the morning the worms that have taken refuge in these holes may be crushed by thrusting the rake handle into them again, and the trap is set for the next night. It is always well in planting to make provision for the loss of a stalk or two by cut worms or other causes, as it is easier to thin out than to replant.

May Beetles.—These are the perfect insects of the white grub, so destructive to lawns and sometimes to meadows. A French plan for destroying, or rather catching, the cockchafer, a very similar insect, is to place in the center of the orchard after sunset an old barrel, the inside of which has been previously tarred. At the bottom of the barrel is placed a lighted lamp, and the insects, circling around to get at the light, strike their wings and legs against the tarred sides of the barrel, and either get fast or are rendered so helpless that they fall to the bottom. Ten gallons of beetles have been captured in this way in a single night.

Slugs.—English gardeners place handfuls of bran at intervals of eight or ten feet along the border of garden walks. The slugs are attracted to the bran, and in the morning each little heap is found covered with them. The ground is then gone over again, this time the operator providing himself with a dustpan and small broom and an empty bucket, and it is an easy matter to sweep up the little heaps and empty them, slugs and all, into the bucket. In this way many hundreds have been taken in a single walk, and if a little salt and water be placed on the bottom of the bucket the slugs coming in contact with it are almost instantly destroyed.

Ants.—When these insects are troublesome in the garden, fill small bottles two thirds with water, and then add sweet oil to within an inch of the top; plunge these into the ground near the nest or hills to within half an inch of the rim, and the insects coming for a sip will get into the oil and perish, as it fills the breathing pores. The writer once entrapped in a pantry myriads of red ants in a shallow tin cover smeared with lard, the vessel having accidentally been left in

their track. Another means of entrapping them, suggested to me by Professor Glover many years ago, is to sprinkle sugar into a dampened sponge near haunts to attract the insects. When they have swarmed through the sponge it is squeezed in hot water, and the trap is reset until the majority of the insects are killed.

Aphis.—A remedy for plant lice upon the terminal shoots of rose bushes (or similar hardy plants), said to work like a charm, is as follows: Take 4 oz. of quassia chips and boil for ten minutes in a gallon of soft water. Take out the chips and add 4 oz. of soft soap, which should be dissolved in it as it cools. Stir well before using, and apply with a moderate sized paint brush, brushing upward. Ten minutes after, syringe the trees with clean water to wash off the dead insects and the preparation, which would otherwise disfigure the rose trees.

Scale.—A French composition for destroying scale insects, plant lice, etc., on fruit and other trees, is as follows: Boil 2 gal. barley in water, then remove the grain (which may be fed to the chickens), and add to the liquid quicklime until it approaches the consistency of paint. When cold, add 2 lb. of lampblack, mixing it for a long time, then add 1½ lb. flowers of sulphur and 1 qt. alcohol. The mixture is applied with a paint brush, first using a stiff bristle brush to remove moss, etc. It not only destroys the insects, but gives the bark greater strength.—*Prairie Farmer.*

Insects to Preserve. See **Anatomical Preparations.**

Insects, Small, to Catch and Kill.—Take a wide mouthed bottle, fill it half full of cotton; after saturating the cotton with chloroform, put on the cotton and in the bottle a round piece of white paper or paste board; hold the mouth of the bottle over a sitting insect and within one minute it will lay dead and clean on the dry, protecting paper.—*Dr. Carl H. Horsch.*

Insulating Compounds. See **Compositions,** *Insulating.*

Insulating Material.—Linseed oil, 2 parts; cotton seed oil, 1 part; heavy petroleum, 2 parts; light coal tar, 2 parts; Venice turpentine, ½ part; spirits of turpentine, 1 part; gutta percha, ½ part; sulphur, 2 parts; heat the oils separately to about 300° F.; cool to 240°, and mix in the other materials, the sulphur last. Heat to 300° F., for about an hour or until the mixture becomes pasty, and on cooling is soft and elastic.

Insulating Paper. See **Paper.**

Insulating Tapes, Cement for. See **Cements.**

Insulating, Varnishes for. See **Varnishes.**

Insulating Wood.—1. Wood for battery jars, etc., is also rendered insulating, by steeping it in or brushing it with melted paraffine.

2. An insulator of 2 parts by weight of Greek pitch and 2 of burnt plaster of Paris is used for electric light work in France. The plaster is pure gypsum highly heated and plunged in water. The compound is applied hot with a brush.

Intensifiers. See **Photography,**

Intoxicating Drinks.—The following treatment is recommended as likely to be successful in attempting to wean a person from indulging to excess in alcoholic drink. Anticipate the craving by supplying food in some acceptable form—a cup of hot cocoatine being an excellent substitute for, or addition to, more solid food; a cup of soup made from Liebig's extract is also useful in the same way. As an addition to food, and to supply the craving for bitter (experienced by drunken persons), an infusion of bark is said not only to afford that, but to create an actual distaste for alcohol in any form. The infusion of bark is made by pouring a pt. of boiling water upon an oz. of coarsely powdered bark, and allowing it to stand near the fire in a covered vessel for five or six hours; dose, a wineglassful two or three times a day. An infusion of quassia is also useful in the same way, made thus: Quassia chips, ¼ oz.; cold water, a pt.; dose, the same as the infusion of bark. A teaspoonful or two of Malt extract may be added to either infusion if liked.

Iodine Paint, Iodine Caustic.—Iodide of potassium, ½ oz.; iodine, ¼ oz.; water (or better, proof spirit), 3 oz.; dissolve by agitation. Used as a paint in cases in which it is desired to apply iodine, in a strong form, locally; also as a caustic for corns, warts, etc. These are the proportions recommended by Soubeiran, with water as the solvent. The tincture of iodine of the pharmacopœia is, however, more generally employed; but it is only of about one third the strength of the above. To compensate for this, the greater volatility of the menstruum admits of more frequent application of the tincture in a short space of time.

Iodine, Tincture of. See **Tinctures.**

Iridescent Paper. See **Paper.**

Iron, Amalgam. See **Amalgams.**

Iron, to Blacken. See **Blacking Metals.**

Iron, to Blue. See **Bluing.**

Iron, Brassing.—Iron ornaments may be covered with brass by removing all organic matter from their surface, which would prevent adhesion, and then plunging them into melted brass. A thin coating of brass is spread over the iron, which may be burnished or polished. See also **Electro-Metallurgy.**

Iron, to Bronze. See **Bronzing.**

Iron Carbonate, Effervescing.—(Dr. T. Skinner.)

Tartaric acid	24 parts.
Sodium bicarb	40 parts.
Iron sulphate (proto)	10 parts.
Sugar, powd	14 parts.
Citric acid	2 parts

Mix the finely powdered dry materials as follows: First, the sulphate of iron with the sugar and part of the tartaric acid; secondly, the citric acid with the remainder of the tartaric acid and the bicarbonate. Stir the two mixtures together, and unite by sifting. Finally granulate in open metal vessel over a water bath.—*Pharmacist.*

Iron, Cement for. See **Cements.**

Iron, Cast, Copper Dip for.—Dissolve 4½ lb. sulphate of copper in water, add 3 fl. oz. sulphuric acid. Used in laying out work.

Iron, Wrought, to Drill.—In drilling wrought iron, use 1 lb. of soft soap mixed with a gallon of boiling water. This is a cheap lubricator, and insures clean cutting by the drill.

Iron, to Enamel. See **Enameling.**

Iron, Fluxes for. See **Fluxes.**

Iron Protected by Gum.—Sheet iron covered with gum of the euphorbiacea, common and luxuriant in tropical climates, was immersed in Chatham, England, dockyard, where everything rapidly becomes foul, and when taken out was found quite clean. The gum is intensely bitter and poisonous; hence marine animals avoid it.

Iron, to Harden. See **Hardening.**

Iron, Lacquers for. See **Lacquers.**

Iron, Bronze Paint for. See **Paints.**

Iron, Cast, to Chill Very Hard.—Salt ½ peck; oil vitriol, ¼ pt.; saltpeter, ¼ lb.; prussiate of potash, ⅛ lb.; cyanide of potash, ¼ lb.; soft water, 5 gal. Heat the iron to a cherry

red, dip in the mixture. If not hard enough repeat the process.

For Malleable Iron.—Put the articles in an iron box, with layers of animal carbon (that is, pieces of horns, hoofs, skins or leather burned so as to be reduced to powder). Lute the box with sand and clay equal parts. Place in the fire and keep at a light red heat, for a length of time proportioned to the depth of steel required. Empty the contents of the box into water.

Iron, to Melt in a Moment.—Ingredient—Roll of sulphur.

Directions.—Heat a piece of iron (a poker will do) to white heat, then apply the roll of sulphur. The iron will immediately melt and run into drops. This experiment is best performed over a wash basin of water, allowing the melted iron to drop into the water.

Iron, to Improve Poor.—Dissolve in soft water 1½ parts of black oxide of manganese, 6 parts copperas, 6 parts common salt; boil until dry; cool, pulverize and mix with nice welding sand. Heat the iron and roll in this mixture, work for a time, and reheat. This treatment will soon free the iron from impurities. Good horse nails can be made out of common iron by this process.

Iron, Paint for. See **Paints.**

Iron, to Polish. See **Polishing.**

Iron Pots, to Clean. See **Cleansing.**

Iron, to Protect.—Cast iron water pipes and other articles may be preserved by covering the inside and out with pitch, heated to 300° F. and kept at this point during the dipping. As the material deteriorates after a number of pipes have been dipped, fresh pitch is frequently added, and at least 8% of heavy linseed oil put to it daily; the vessel is also entirely emptied of the pitch and refilled with fresh material, as often as is necessary to insure the perfection of the process. Each casting is kept immersed from thirty to forty-five minutes, or until it attains a temperature of 300° F. After the bath is completed, the castings are removed and placed to drip in such a position that the thickness of the varnish will be uniform. It is essential that the coating be tenacious when cold, and not brittle or disposed to scale off. The pitch or varnish is made from coal tar, distilled until all the naphtha is removed, the material deodorized, and the pitch like wax or very thick molasses.

Iron, to Prevent Rust on. See **Rust.**

Iron, to Silver. See **Silvering.**

Iron Surfaces, Lemon Juice on.—*The Scientific American* states that lemon juice gives an effective and elegant result when applied to cast iron surfaces. It turns the portion of polished cast iron to which it is applied to a bronze black, and when touched over with shellac varnish will absorb a sufficient amount of the varnish to preserve it. To many, lemon juice would seem to be a weak and ineffective acid for metal; but every one knows how quickly a knife blade of steel will blacken when used to cut a lemon, and the darkening of polished iron by the acid is very beautiful.

Iron, to Temper. See **Tempering.**

Iron and Steel, to Test.—To test iron and steel: Nitric acid will produce a black spot on steel; the darker the spot, the harder the steel. Iron, on the contrary, remains bright if touched with nitric acid. Good steel in its soft state has a curved fracture and a uniform gray luster; in its hard state, a dull, silvery uniform white. Cracks, threads or sparkling particles denote bad quality. Good steel will not bear a white heat without falling to pieces, and will crumble under the hammer at a bright red heat; while at a middling heat it may be drawn out under the hammer to a fine point. To test the toughness, place the fragment on a block of cast iron; if good, it may be driven by a hammer into the iron; if poor, it will be crushed under the blow.

Iron, to Tin. See **Tinning.**

Iron, to Weld. See **Welding.**

Isinglass.—The best quality of American isinglass is made from the sounds of the hake. The crude material is collected during the summer and autumn, coming from Maine, New Brunswick, Nova Scotia, and Prince Edward's Island. The conversion of the crude material into the mercantile article takes place in winter. A low temperature is necessary in order to turn out by machinery the fine ribbons of isinglass, and ice water passes through the rolls. The total product is about 250,000 lb. Besides the use of isinglass for fining beer, etc., it is employed as a dressing or glaze for straw goods in the United States.—*Scient. Amer.*

Isomerism.—In chemistry, identity of composition with dissimilarity of properties. Isomeric compounds (isomerides) are such as contain the same elements in the same proportions, but which differ from each other in their chemical properties; thus, formate of ethyl and acetate of methyl are isomeric, having precisely the same ultimate composition, though differing in the arrangement of their elements.

Isomorphism.—In chemistry, the quality possessed by bodies differently composed of assuming the same crystalline form. Isomorphous substances are found to be closely allied in their chemical nature; and the fact of two bodies crystallizing in the same form has often led to the discovery of other points of similarity between them. The alums, for instance, no matter what their components, all crystallize in octahedra; and a crystal of potassium alum, if transferred to a solution of chrome alum, will continue to increase with perfect regularity from the deposition of the latter salt.

Ivory, Artificial Ivory.—1. Four parts of shellac mixed with 16 parts of ammonia. Place in revolving cylinders for five hours, at a temperature of 99·5° F. A complete solution of the consistency of a thin sirup will be the result. Add to this 20 parts zinc oxide, mix thoroughly and grind in a color mill. The ammonia is driven off by heating. Press into moulds.

2. Dissolve 2 lb. of pure India rubber in 32 lb. of chloroform and saturate the solution with pure ammoniacal gas. Then distill the chloroform off at a temperature of 185° F. Mix the warm residue with phosphate of lime or carbonate of zinc, press it in moulds and let it cool. If using carbonate of zinc, the preparation is the whitest and finest; but if using phosphate of lime it resembles natural ivory better, and partakes more of its properties, as it contains a sufficient amount of the solid bone substance (phosphate of lime), while the India rubber serves in place of the cartilage and gelatine which cements it together. The introduction of the other ingredients of the natural ivory has been found to be inessential. In regard to the statement that the difference cannot be discovered, this is entirely erroneous. For instance, the microscope alone, which shows in thin slices of the natural ivory the peculiar bone structure so well known to all anatomists, is sufficient to detect the imitations by reason of the total absence of all traces of organic growth.

3. The *Chronique Industrielle* gives the following description of a new process for making artificial ivory from the bones of sheep and goats and the waste of white skins, such as kid, deer, etc. The bones are macerated for ten or fifteen hours in a solution of chloride of lime, and afterward washed in clean water and allowed to dry. Then they are put with all the scraps of hide, etc., into a specially constructed boiler, dissolved by steam so as to form a fluid mass, to which is added 2½% of alum.

The foam is skimmed off as it rises, until the mass is clear and transparent. Any convenient coloring matter is then added, and while the mass is still warm it is strained through cloth of appropriate coarseness and received in a cooler and allowed to cool until it has acquired a certain consistency so that it can be spread out on the canvas without passing through it. It is dried on frames in the air, and forms sheets of convenient thickness. It is then necessary to harden it, which is accomplished by keeping it for eight or ten hours in an alum bath that has been used before.

The quantity of alum necessary for this operation amounts to 50% by weight of the gelatine sheets. When they have acquired sufficient hardness, they are washed in cold water and let dry on frames, as at first.

This material works more easily and takes as fine a polish as real ivory.

4. Mix 20 parts by weight of white shellac, 16 parts of ivory dust, 9 parts of acetate of lead and 10 parts of camphor. Heat these ingredients, dry, powder and press.

Ivory, to Bleach. See **Bleaching.**

Ivory, Cement for. See **Cements.**

Ivory, to Clean. See **Cleansing.**

Ivory, to Dye. See **Dyeing.**

Ivory, Vegetable Dyeing of.—L. Müller finds that objects of this material may be stained by boiling them for a long time in a perfectly clear solution of the desired coloring matter. Aniline red, picric acid, or potassium dichromate, iodine green, sumac, aniline dyes, etc., may be used conveniently. The ivory must be thoroughly clean. It may be bleached by immersion for several hours in a solution of permanganate, and then in sulphurous acid.

Ivory, Etching on. See **Etching.**

Ivory, Flexible.—Immerse the ivory in a solution of pure phosphoric acid, sp. gr. 1·13, until it partially loses its opacity, then wash in cold soft water and dry. This renders ivory very flexible, but it regains its hardness if long exposed to dry air. Its pliability may, however, be restored by immersion in hot water.

Ivory, Glue for. See **Glues.**

Ivory, to Harden.—To harden ivory after it has been softened, wrap in a sheet of white paper, cover with dry, decrepitated salt, let it remain for 24 hours, when it will be restored to its original hardness.

Ivory, Imitation of.—The composition for making imitation ivory is as follows: Powder very finely some egg shell. Make isinglass and brandy into a paste with the egg shell. Color it as desired. The mould must be oiled, and the paste poured in warm. When dry it is ready for use.

Ivory, Inlaying Imitation.—A quantity of best plaster of Paris, dried in an oven, kept in a well corked bottle for use. Now, suppose we want to fill in, say, lines of any pattern. Mix up a small quantity of the plaster of Paris with weak clear glue; fill in and smooth over. When dry it may be glass papered down to the level of the surrounding wood. If wanted colored, mix with the plaster of Paris any of the powder colors, such as ultramarine, amber, vermilion, or yellow ocher. For cheapness you better use the various colored ochers. The chief secret is to have the powders, plaster of Paris, etc., quite dry. In polishing but little extra care is required. Merely take a brush, dip it in the white polish, if for light goods, and brush two or three coats over the plaster—this fills up the pores or grain, if to use the phrase—then polish in the usual manner

Ivory, Fluid for Marking.—Nitrate of silver, 2 parts; nitric acid, 1 part; water 7 parts, mix.

Ivory, to Soften.—1. In 3 oz. of spirits of niter, and 15 of water, mixed, put the ivory and leave for three or four days.

2. To make Ivory Soft and Flexible.—Take a solution of phosphoric acid of 1·130 sp. gr. Put the ivory in this solution, and let it remain until it has a transparent appearance. Take out, wash carefully, dry between soft linen. The ivory will be soft as thick leather. It will become hard if it is exposed to the air, but become soft again if placed in warm water.

Ivory, to Stain. See **Staining.**

Ivory, Substitute.—Melt together over a gentle fire in an iron pot: Pitch, 1 part; gutta percha, 2 parts; orange shellac, 5 parts; add to this 6 parts of white lead (lead carbonate), in impalpable powder, and stir until a perfectly homogeneous mixture is obtained; then cast and turn out. Color with the aniline dyes mixed with dilute alcoholic solution of bleached shellac.

Ivory, to Work.—Turned work should require very little polishing. All tools should be kept very sharp. In polishing the greatest care should be used not to round the sharp corners which give so much beauty to ivory work. Emery paper is not recommended, but can be used on rough work. Use whiting and water, and with a chamois skin. Then apply a plain rag with a little oil if necessary. Jewelers' brushes wet with water and dipped in whiting are used for complicated work.

Jacoby's Alloy. See **Alloys.**

Japanning and Japans.—When finished wood, papier mache, composition, or materials are varnished in the usual manner and left to dry in the air; the drying is in most cases imperfect, and the coating more or less uneven. If the surface thus varnished is heated for some time to a temperature of from 250° to 300° Fah. or higher, it is found that the whole of the solvent or vehicle of the gums or resins in the varnish is soon driven off, and the gummy residue becomes liquefied or semi-liquefied, in which state it adapts itself to all inequalities, and if the coating is thick enough, presents a uniform glossy surface, which it retains on cooling. This process of drying out and fusion secures a firm contact and adhesion of the gums or resins to the surface of the substance varnished, and greatly increases the density of the coating, which enables it to resist wear and retain its gloss longer.

This process of hardening and finishing varnished or lacquered work by the aid of heat, constitutes the chief feature of the japanner's art.

In practice the work to be japanned is first thoroughly cleansed and dried. If of wood, composition, or other porous material, it is given, while warm, several coats of wood filler, or whiting mixed up with a rather thin glue size, and is, when this is hardened, rubbed down smooth with pumice stone. It is then ready for the japan grounds. Metals as a rule require no special preparation, receiving the grounds directly on the clean dry surface.

In japanning, wood and similar substances require a much lower degree of heat and usually a longer exposure in the oven than metals, and again a higher temperature may be advantageously employed when the japan is dark than when light colored grounds are used; so that a definite knowledge of just how much heat can be safely applied and how long an exposure is required with different substances and different grounds can only be acquired by practical experience. Large japanners seldom make their own varnishes, as they can procure them more cheaply from the varnish maker.

The japanner's oven is usually a room or large box constructed of sheet metal, and heated by stove drums or flues, so that the temperature—which is indicated by a thermometer or pyrometer hung up inside, or with its stem passing through the side wall midway between

the top and bottom of the chamber—can be readily regulated by dampers. The ovens are also provided with a chimney to carry off the vapors derived from the drying varnish, a small door through which the work can be entered and removed and wire shelves and hooks for its support in the chamber. The ovens must be kept perfectly free from dust, smoke, and moisture.

A good cheap priming varnish for work to be japanned consists of:

Shellac, pale	2 oz.
Rosin, pale	2 oz.
Rectified spirit	1 pt.

Two or three coats of this is put on the work in a warm dry room. A good black ground is prepared by grinding fine ivory black with a sufficient quantity of alcoholic shellac varnish on a stone slab with a muller until a perfectly smooth black varnish is obtained. If other colors are required, the clear varnish is mixed and ground with the proper quantity of suitable pigments in a similar manner; for red, vermilion or Indian red; green, chrome green or Prussian blue and chrome yellow; blue, Prussian blue, ultramarine or indigo; yellow, chrome yellow, etc. But black is the hue commonly required. The following are good common black grounds:

1. Asphaltum ..... 1 lb.
   Balsam of capivi ..... 1 lb.
   Oil of turpentine ..... q. s.

The asphaltum is melted over a fire, and the balsam, previously heated, is mixed in with it. The mixture is then removed from the fire and mixed with the turpentine.

2. Moisten good lampblack with oil of turpentine and grind it very fine with a muller on a stone plate. Then add a sufficient quantity of ordinary copal varnish and rub well together.

3. Asphaltum ..... 3 oz.
   Boiled oil ..... 4 qt.
   Burnt umber ..... 8 oz.
   Oil of turpentine ..... q. s.

Melt the asphaltum, stir in the oil, previously heated, then the umber, and when cooling thin down with the oil of turpentine.

4. An extra fine black is prepared from:

Amber	12 oz.
Asphaltum, purified	2 oz.
Boiled oil	½ pt.
Resin	2 oz.
Oil of turpentine	16 oz.

Fuse the gum and resin and asphaltum, add the hot oil, stir well together, and when cooling add the turpentine.

A white ground is prepared from copal varnish and zinc white or starch.

From one to six or more coats of varnish are applied to work in japanning, each coat being hardened in the oven before the next is put on. The last coat in colored work is usually of clear varnish, without coloring matters, and is in fine work sometimes finished with rotten stone and chamois. For ordinary work the gloss developed in the oven under favorable conditions is sufficient.

Japan Finishing.—The finishing part of japanning lies in laying on and polishing the outer coats of varnish, which is necessary in all painted or simply ground colored japan work. When brightness and clearness are wanted, the white kind of varnish is necessary for seed lac varnish, which is the hardest and most tenacious, imparts a yellow tinge. A mixed varnish, we believe, is the best for this purpose, that is, for combining hardness and purity. Take then 3 oz. of seed lac, picked very carefully from all sticks and dirt, and washing it well with cold water, stirring it up, pouring it off, and continuing the process until the water runs off perfectly pure. Dry it and then reduce it to powder, and put it with a pt. of alcohol into a bottle, of which it must occupy only two thirds of its space. This mixture must be shaken well together and the bottle kept at a gentle heat (being corked) until the lac be dissolved. When this is the case the clear must be poured off and the remainder strained through a cloth, and all the clear, strained and poured, must be kept in a well stopped bottle. The manner of using this seed lac varnish is the same as that before described, and a fine polishing varnish is made by mixing this with pure white varnish. The pieces of work to be varnished for finishing should be placed near a stove or in a warm, dry room, and one coat should be perfectly dry before the other is applied. The varnish is applied by proper brushes, beginning at the middle, passing the stroke to one end and with the other stroke from the middle to the other end. Great skill is displayed in laying on these coats of varnish. If possible the brush should never cross or twice pass over in giving one coat. When one coat is dry another must be laid over it, and so on successively for a number of coats, so that the coating should be sufficiently thick to stand fully all the polishing, so as not to bare the surface of the colored work. When a sufficient number of coats are thus laid on the work is fit to be polished, which, in common cases, is commenced with a rag dipped in finely powdered rotten stone, and toward the end of the rubbing a little oil should be used along with the powder, and when the work appears fine and glossy a little oil should be used alone to clean off the powder and give the work a still brighter hue. In very fine work French whiting should be used, which should be washed in water to remove any sand that might be in it. Pumice stone ground to a very fine powder is used for the first part of the polishing, and the finishing done with whiting. It is always best to dry the varnish of all Japan work by heat. For wood work heat must be sparingly used, but for metals the varnish should be dried in an oven, also for papier mache and leather. The metal will stand the greatest heat, and care must be taken not to darken by too high a temperature. When gold size is used in gilding for japan work, where it is desired not to have the gold shine or appear burnished, the gold size should be used with a little of the spirits of turpentine and a little oil, but when a considerable degree of luster is wanted without burnishing and the preparation necessary for it, a little of the size along with oil alone should be used.

Black Japan Grounds.—1. Mix shellac varnish with either ivory black or lampblack; but the former is preferable. These may be always laid on with the shellac varnish, and have their upper or polishing coats of common seed lac varnish.

2. A common black japan may be made by painting a piece of work with drying oil and putting the work into a stove, not too hot, but of such a degree as will change the oil black without burning it, gradually raising the heat and keeping it up a long time. This requires no polishing.

3. Asphaltum, ½ lb.; melt, then add hot balsam of capivi, 1 lb., and when mixed, thin with hot oil of turpentine.

4. Grind lampblack very smooth on a marble slab with a muller with turpentine, and then add copal varnish to the proper consistency.

Japan Black.—1. Asphaltum, 3 oz.; boiled oil, 4 qt.; burnt umber, 8 oz. Mix by heat, and when cooling thin with turpentine.

2. Amber, 12 oz.; asphaltum, 2 oz.; fuse by heat, add boiled oil, ½ pt.; resin, 2 oz.; when cooling add 16 oz. oil of turpentine. Both are used to varnish metals.

Japan Black, for Leather,—Burnt umber, 4 oz.; true asphaltum, 2 oz.; boiled oil, 2 qt. Dissolve the asphaltum by heat in a littleof the oil, add the burnt umber ground in oil, and the

remainder of the oil; mix, cool and thin with turpentine. Flexible.

Blue Grounds.—Blue japan grounds may be formed of bright Prussian blue. The color may be mixed with shellac varnish and brought to a polishing state by five or six coats of seed lac varnish. The varnish, however, is apt to give a greenish tint to the blue, as the varnish has a yellowish tinge, and blue and yellow form a green. Whenever a light blue is desired, the purest varnish must always be used.

Green Grounds.—A good green may be made by mixing Prussian blue along with the chromate of lead, or with turmeric, or orpiment (sulphuret of arsenic) or ocher, only the two should be ground together and dissolved in alcohol and applied as a ground, then coated with four or five coats of shellac varnish in the manner already described. A very bright green is made by laying on a ground of Dutch metal or leaf of gold, and then coating it over with distilled verdigris dissolved in alcohol, then the varnishes on the top. This is a splendid green, brilliant and glowing.

Orange Colored Grounds.—Orange grounds may be made of yellow mixed with vermillion or carmine, just as a bright or rather inferior color is wanted. The yellow should always be in quantity to make a good full color, and the red added in proportion to the depth of shade. If there is not a full good body of yellow, the color will look watery or bare, as it is technically termed.

Japan, Purple Grounds.—This is made by a mixture of lake and Prussian blue or carmine, or for an inferior color vermilion, and treated as the foregoing. When the ground is laid on and perfectly dried, a fine coat of pure boiled nut oil then laid on and perfectly dried is a good method to have a japan not liable to crack. But a better plan is to use this oil in the varnish given the first coat, after the ground is laid on, and which should contain considerable of pure turpentine. In every case where oil is used for any purpose for varnish, it is all the better if turpentine is mixed with it. Turpentine enables oils to mix with either alcohol or water. Alkalies have this property also.

Red Japan Ground.—The base of this japan ground must be made up with madder lake, ground with oil of turpentine; this forms the first ground; when perfectly dry, a second coat must be applied, composed of lake and white copal varnish; and the last with a coat composed of a mixture of copal and turpentine varnish mixed up with lake. Vermilion or carmine can also be used for red japan instead of lake.

White Ground.—To form a hard, perfect white ground is no easy matter, as the substances which are generally used to make the japan hard have a tendency, by a number of coats, to look or become dull in brightness. One white ground consists of the following composition: White flake or lead washed over and ground up with ¼ of its weight of starch, then dried and mixed with the finest gum, ground up in parts of 1 oz. gum to ½ oz. of rectified turpentine, mixed and ground thoroughly together. This is to be finely laid on the article to be japanned, dried, and then varnished with 5 or 6 coats of the following: Two oz. of the finest seed lac to 3 oz. of gum anime, reduced to a fine powder and dissolved in a qt. of alcohol. The lac must be carefully picked. For a softer varnish than this, a little turpentine should be added, and less of the gum. A very good varnish and not brittle, may be made by dissolving gum anima in nut oil, boiling it gently as the gum is added, and giving the oil as much gum as it will take up. The ground of white varnish may of itself be made of this varnish, by giving 2 or 3 coats of it, but when used it should be diluted with pure turpentine. Although this varnish is not brittle, it is liable to be indented with strokes, and it will not bear to be polished, but if well laid on it will not need to be laid on afterward; it also takes some time to dry. Heat applied to all oils, however, darkens their color, and oil varnishes for white grow very yellow if not exposed to a full clear light.

Yellow Japan Grounds.—1. King's yellow may be used, and the effect will be heightened by dissolving powdered turmeric root in the spirits of wine, of which the upper or polishing coat is made, which spirits of wine must be strained from off the dregs before the seed lac is added to it to form the varnish.

2. If turmeric be dissolved in the spirit of wine and strained through a cloth and then mixed with pure seed lac varnish, it makes a good yellow japan. Saffron will answer for the same purpose in the same way, but the brightest yellow ground is made by primary coat of pure chrome yellow, and coated successively with the varnish.

3. Dutch pink is used for a kind of cheap yellow japan ground. If a little dragon's blood be added to the varnish for yellow japan, a most beautiful and rich salmon colored varnish is the result, and by these two mixtures all the shades of flesh colored japans are produced.

Aniline, Colors for.—Many of the clear varnishes and oils may be colored directly with some of the aniline dyes by mixing the coloring material with the solvent used. These dyes do not hold their colors very well at high temperatures.

Black.—1. Burnt umber, 8 oz.; true asphaltum, 3 or 4 oz.; boiled linseed oil, 1 gal.; grind the umber with a little of the oil, add it to the asphaltum, previously dissolved in a small quantity of the oil by heat; mix, add the remainder of the oil, boil, cool and thin with a sufficient quantity of oil of turpentine. Flexible.

2. Shellac, 1 oz.; wood naphtha, 4 oz.; lampblack to color; dissolve. Inflexible. Both are used for leather.

Carriage Japan.—Forty gal. raw linseed oil, 40 lb. litharge, 20 lb red lead, 10 lb. black oxide of manganese, 2 lb. white gum shellac. Set the oil over the fire and bring to the boiling point; add by degrees litharge and red lead alternatively and slowly; add the gum, and when this is melted put in the manganese, and keep the whole in rapid motion from the time the oil is 200° Fah. until the making is finished. When the mixture is cool enough to bear the finger in a moment add from 20 to 30 gal. spirits of turpentine.

Imitation of Japanning.—The peculiar glossy surface on the so-called japan trays can only be given by practice, but a near imitation may be effected as follows: Mix ivory black with melted size, apply the mixture quite hot to the box, or any other wooden article that it may be desired to treat in this manner; when dry, sand paper the box, then give another coat of black; when this second coat is dry, bring to smoothness with sand paper, at the same time taking care not to remove the stain, so that the light wood below is exposed. Now procure 1 lb. of black japan and 1 gill of turpentine; mix enough of the black japan for present use with turpentine, of which only sufficient should be used to make the japan fluid enough to run from the brush. A fine haired paint brush should be employed. If properly done one coat will be sufficient. The box will look nearly equal to the japan goods. Dry the varnished box in a warm room free from dust.

To Japan Old Tea Trays.—First clean them thoroughly with soap and water and a little rotten stone; then dry them by wiping and exposure at the fire. Now get some good copal varnish, mix with it some bronze powder, and apply with a brush to the denuded parts. After which set the tea tray in an oven at a heat of from 212° to 300° F. until the varnish is dry. Two coats will make it equal to new.

Japan Flow for Tin.—Spirits of turpentine, 3 qts.; balsam of tolu, 3 oz.; linseed oil, ¾ pt.;

acetate of lead, 3 oz.; balsam of fir, 3 oz.; gum sandarac, 1½ lb. Put all these materials, except the turpentine, in a suitable vessel, place over a slow fire at first, then increase the heat until they are melted. When a little cool, stir in the turpentine, and strain. This japan is transparent, but may be colored if desired.

2. Melt 50 lb. Naples asphaltum and 8 lb. dark gum anime; boil for about two hours in 12 gal. linseed oil; then melt 12 lb. dark gum amber, and boil it with 2 gal. linseed oil; add this to the other, and add driers. Boil for about 2 hours, or until the mass, when cooled, may be rolled into little pellets. Withdraw the heat, and thin down with 30 gal. turpentine. During the boiling the mass must be constantly stirred to prevent boiling over.

3. Japan for Tin Lantern.—The following are the proportions for black japan: Asphaltum, 1½ oz.; boiled linseed oil, 4 pt.; burnt umber, 4 oz. Heat till well mixed, and when cool add turpentine till of a proper consistence.

Japan, The Tortoise Shell.—Tortoise shell japan is extremely pretty, and comparatively easy to manipulate. The work is first coated with a japan made by boiling 2 pt. linseed oil, to which ¼ lb. umber has been added, till it becomes thickened; the mixture is then strained and further boiled till it becomes of a pitchy consistency. This is mixed with turpentine to a workable consistency, and then applied. On a thoroughly dry coating of this japan lay a quantity of vermilion spots to represent the clear portions of the shell. The vermilion japan is made by adding vermilion to shellac varnish; it should be laid on thinly and dried. The whole surface is then finally coated with a thin layer of the above described brown japan, still further diluted with turpentine. A long course of stoving will be necessary to thoroughly harden the japanning.

Japan, Transparent.—Prep. Oil of turpentine, 8 oz.: oil of lavender, 6 oz.; camphor 1 drm.; bruised copal, 2 oz. Dissolve. Used for japanning tin; quick-drying copal varnish is usually substituted.

Japan Varnishes. See **Varnishes.**

Javelle Water. See **Waters.**

Jet, Cement for. See **Cements.**

Jet, to Clean. See **Cleansing.**

Jet Working.—1. Small chisels of ordinary shape are used in turning jet on a lathe. The action is more of a scrape than a distinct cut. A knife the size of a penknife, with the point beveled off and then set like a chisel, is used in carving jet. Jet is first polished on a revolving wooden wheel with rotten stone and water, and then finished off on a board covered with stout leather — often porpoise hide — impregnated with rouge or lampblack mixed with a very small quantity of oil.

2. The tools used for turning jet are beveled from both sides like a turner's soft wood chisel, only they are held with the edge horizontal and scrape rather than cut. Their edges are very thin and keen. A small gouge, also beveled from both sides, is used for roughing out. For polishing use first fine emery cloth, then charcoal dust and soft soap on a flannel. Finish with the same, only adding more soft soap. Sometimes rotten stone on the hand or flannel is used as a finish. No heat is required.

Jewels, Artificial.—The base used in making artificial gems is strass, obtained by melting together 6 drm. carbonate of soda, 2 drm. burnt borax, 1 drm. saltpeter, 3 drm. minium and 1½ oz. purest white sand. To imitate in color the following minerals, add to the strass the ingredients named in connection with each gem: Sapphire, 10 grn. carbonate of cobalt; opal, 10 grn. oxide of cobalt, 15 grn. oxide of manganese, and from 20 to 30 grn. protoxide of iron; amethyst, 4 to 5 grn. carbonate or peroxide of manganese; gold topaz, 30 grn. oxide of uranium; emerald, 20 grn. protoxide of iron and 10 grn. carbonate of copper.

Jewels, Imitation.—The following are some of the very latest recipes for making imitation stones. The coloring substances are the following oxides: Gold, for purple (purpura cassia); silver, for yellowish green; copper, for bright green; iron, for pale red; cobalt, for blue; tin, for white; manganese, in small quantity to make the glass devoid of color; in a larger, to give it an amethyst color; in great quantity, to make it black and opaque; antimony, for reddish hyacinth color.

To prepare the mass for the body proceed as follows: Pure flint or rock crystal is heated white, cooled in water, pulverized and sifted with a silk sieve, thereupon exposed to the action of muriatic acid for several hours, washed, dried and again sifted. Of this substance five different bases are prepared:

For the first base—1½ parts of the flint or rock crystal powder; 2½ parts white lead in scales, ½ part saltpeter, ½ part borax, ½ part white arsenic.

For the second base—1 part prepared flint, 2½ parts white lead, ½ part cream of tartar, ¼ part calcined borax.

For the third base—1 part prepared rock crystal, 2 parts red lead, ½ part saltpeter, ½ part cream of tartar; pulverize the mixture, melt it three times, and after every melting pour into cold water. This for the three preceding bases.

For the fourth base—1 part prepared rock crystal, 3 parts calcined borax, 1 part cream of tartar; melt, pour the mass into lukewarm water, add an even amount of red lead (minium) and repeat the melting and cooling twice.

For the fifth base—Take 1 part prepared rock crystal and 3 parts cream of tartar, melt in a crucible, dissolve the mass in warm water and add nitric acid as long as a boiling takes place; it is then carefully washed, dried, and 1½ parts white lead are added. To 1½ parts of this mixture add ½ parts calcined borax, next melt and pour into cold water. This makes, when ½ part saltpeter is added, a handsome crystal glass, which, without further addition, makes the artificial diamond called Strass, from its inventor.

The following are recipes for imitations of precious stones.

For Yellow Diamond,—16 oz. of fourth base; 24 grn. horn silver; 10 grn. antimony.

Sapphire.—25 oz. of fifth base; 2 drm., 46 grn. cobalt.

Oriental Ruby.—1 oz. of fifth base, and a mixture of 2 drm., 48 grn. purple of gold, and the same quantity of sulphuret of antimony and fusible manganese, and 2 oz. of rock crystal; or, 20 oz. of the flint base, ½ oz. fusible manganese, and 2 oz. rock crystal.

Balay Ruby.—16 oz. of fifth base, and the preceding coloring substance, lessened by one-fourth; or, 20 oz. flint base, same coloring mass, but less manganese by one-fourth.

Oriental Topaz.—24 oz. of first or third base; 5 drm. black antimony.

Brazilian Topaz.—24 oz. of second or third base; 1 oz., 24 grn. black antimony; 8 grn. purpura cassia (purple of gold).

Saxonian Topaz.—24 oz. of first or third base; 6 drm. black antimony.

Amethyst.—24 oz. of fifth base; 4 drm. manganese; 4 grn. purple of gold.

Emerald.—15 oz. of any one base; 1 drm. blue carbonate of copper; 6 grn. antimony; or, 1 oz. of second base; 20 oz. black antimony; 4 grn. cobalt.

Beryl.—24 oz. of third base; 96 grn. black antimony; 4 grn. cobalt.

Common Opal.—1 oz. of third base; 2 grn. loadstone; 20 grn. of some absorbing earth.

For the imitation of pearls, thin balls of glass are used, which by an addition of a small quantity of potash and oxide of lead, receive a bluish glittering sheen, and the inner sides of

which are covered with the scales of a small river fish (*Cyprinus alburnus*). To make these scales pliable and adhesive, they are steeped for some time in spirits of ammonia in which a small amount of isinglass has been dissolved. Messrs. Savary & Mosbach exhibit some which, being solid, are in all respects equal to the Roman.

Gems, Artificial.—P. Weiskopf gives in the *Diamant* the following formulæ for the frit or mass used in Bohemia for making imitations of some of the precious stones;

Imitation Agates.—10 kilos quartz, 17 kilos red lead, 3·2 kilos potash, 2·2 kilos borax, and 0·1 kilo arsenic. The quantity of chloride of gold added is equal to that obtained from 0·4 of a ducat.

Agate Glass.—10 parts of broken glass is melted, and to it are added 0·15 part suboxide of copper, the same quantity of the oxides of chromium and of manganese, 0·02 part each of oxide of cobalt and nitrate of silver, 0·01 part oxide of uranium, 0·4 part red argols, 0·3 part bone meal. Each oxide is added alone, and at intervals of ten minutes. After heating the mixture for an hour, 0·3 or 0·4 part of fine soot is put in.

Red Marble.—80 parts of sand, 40 parts of potash, 10 parts of lime, 2 parts of table salt, 1 part of saltpeter, and 0·1 part of arsenic. The mixture is melted, and then 25 parts of suboxide of copper and 1 part of saltpeter mixed in.

Joints, Cement for. See **Cements.**

Julep, Mint.—This is made precisely in the same manner as sherry cobbler, except that you use brandy instead of wine, and you add to your fruits three or four sprigs of fresh spearmint. Decorate the top with sprigs of mint instead of flowers.

Jute.—A variety of bast fiber now often mixed with or substituted for cotton.

Jute, to Bleach. See **Bleaching.**

Jute, to Dye. See **Dyeing.**

Kalsomine.—Prepared kalsomine can be readily purchased at any large paint store, but some of our readers may wish to prepare their own kalsomine. The following rules are given for the purpose of enabling them to do so:

Soak 1 lb. of white glue overnight, then dissolve it in boiling water and add 20 lb. of Paris white, diluting with water until the mixture is of the consistency of rich milk. To this any tint can be given that is desired.

Lilac.—Add to the kalsomine 2 parts of Prussian blue and 1 part of vermilion, stirring the mixture thoroughly and taking care to avoid too high a color.

Brown.—Burnt umber.

Gray.—Raw umber, with a trifling amount of lampblack.

Rose.—Three parts of vermilion and 1 part of red lead, added in very small quantities until a delicate shade is produced.

Lavender.—Make a light blue and tint it slightly with vermilion.

Straw.—Chrome yellow, with a touch of Spanish brown.

Buff.—Two parts of spruce, or Indian yellow, and one part of burnt sienna.

Blue.—A small quantity of Prussian blue will give a soft azure tint. Dark blue is never desirable.

Delicate tints in the foregoing varieties of colors are always agreeable and tasteful, and so great care must be taken that they are not too vivid. The tints will always appear brighter than in the kalsomine pot, and this fact must be kept in mind when adding the coloring powders.

Kalydor.—A name given to several nostrums extensively advertised in Europe and America, and pretending to possess extraordinary power of beautifying the skin.

Rowland's Kalydor.—This is said to resemble Gowland's lotion, but it is got up in a more pleasing and showy style.

Kamptulicon.—A mixture of cork and caoutchouc. The cork is ground fine and mixed with caoutchouc by a somewhat complicated process. It is used for a floor covering and also for cushions of presses, etc.

Kaolin.—Term rather loosely applied to the clays used in making porcelains. Ordinary kaolin is the result of the decomposition of aluminous minerals.

Kelp.—The ash obtained by incinerating the sea weeds on the British coasts. It is weaker in alkali than soda ash and even than barilla, and is employed by alkali manufacturers to mix off strong soda ash.

Kerosene, to Deodorize.—By agitation for several days with powdered chloride of calcium, the disagreeable odor of the oil may be removed, but the oil cannot be completely deodorized.

Kerosene, to Remove. See **Cleansing.**

Keys, to Fit.—When it is not convenient to take a lock apart to fit a new key, the key blank should be smoked over a candle inserted in the keyhole and pressed firmly against the opposing wards of the lock. The indentations in the smoked portion made by the wards will show where to file.

Kid Gloves, to Clean. See **Cleansing.**

Kid Gloves, to Dye. See **Dyeing.**

Kieselguhr.—Kieselguhr is an infusorial earth which is principally used in the manufacture of dynamite. It is a white powder, and, as it consists of the skeletons of diatoms, is of a siliceous character and well adapted for making polishing soap. Deposits of it are found in Aberdeenshire.

Killing Agents. See **Microscopy.**

Kindlings.—1. Save the corn cobs for kindlings, especially if wood is not going to be plentiful next winter. To prepare them, melt together 60 parts resin and 40 parts tar. Dip in the cobs and dry on sheet metal heated to about the temperature of boiling water.

2. Dip the wood in melted resin. The following composition is sometimes used: 60 parts melted resin and 40 parts tar, in which the wood is dipped for a moment. Or, take 1 qt. of tar and 3 lb. of resin, melt them, then cool; mix as much sawdust with a little charcoal added as can be worked in. Spread out on a board and when cold break up into lumps the size of a hickory nut, and you will have enough kindling to last a good while. See also **Fire Kindlers.**

Kingston's Metal. See **Alloys.**

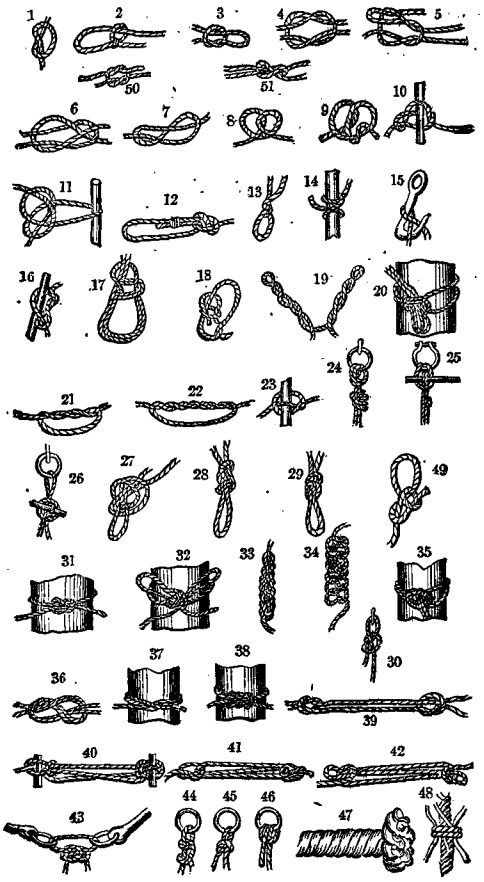
Kirchwasser.—A spirituous liquor distilled in Germany from bruised cherries. See **Liquors.**

Knifeboard.—A common knifeboard covered with thick buff leather, on which is put emery, 1 part; crocus root, 3 parts, in very fine powder; mixed into a thick paste, with a small amount of lard in sweet oil, and spread on the leather to the thickness of a quarter, gives a superior edge and polish to knives, and will not wear the knives so much as the common method of brick dust on a board.

Knots, to Bore through.—To bore a hole easily through a hemlock or other knot, wet your auger in turpentine.

Knots.—The knots represented on the following page of engravings are as follows:

1. Simple overhand knot.
2. Slip-knot seized.
3. Single bow-knot.
4. Square or ruf-knot.
5. Square bow-knot.
6. Weaver's knot.
7. German or figure-of-8 knot.
8. Two half-hitches, or artificer's knot.
9. Double artificer's knot.
10. Simple galley-knot.



Knots.

11. Capstan, or prolonged knot.
12. Bowline-knot.
13. Rolling-hitch.
14. Clove-hitch.
15. Blackwall-hitch.
16. Timber-hitch.
17. Bowline on a bight.
18. Running bowline.
19. Catspaw.
20. Doubled running-knot.
21. Double knot.
22. Sixfold knot.
23. Boat-knot.
24. Lark's head.
25. Lark's head.
26. Simple boat-knot.
27. Loop-knot.
28. Double Flemish knot.
29. Running-knot checked.
30. Crossed running-knot.
31. Lashing-knot.
32. Rosette.
33. Chain-knot.
34. Double chain-knot.
35. Double running-knot, with check-knot.
36. Double twist-knot.
37. Builder's knot.
38. Double Flemish knot.
39. English knot.
40. Shortening-knot.
41. Shortening-knot.
42. Sheep-shank.
43. Dog-shank.
44. Mooring-knot.
45. Mooring-knot.
46. Mooring-knot.
47. Pigtail worked on the end of a rope.
48. Shroud-knot.
49. A bend or knot used by sailors in making fast to a spar or a bucket handle before casting overboard; it will not run. Also used by horsemen for a loop around the jaw of a colt in breaking; the running end, after passing over the head of the animal and through the loop, will not jam therein.
50. A granny's knot.
51. A weaver's knot.

The principle of a knot is, that no two parts which would move in the same direction, if the rope were to slip, should lie alongside of and touching each other. —From *Scientific American Reference Handbook.*

Kola Wine. See **Wines.**

Koumiss.—1. Fill a qt. champagne bottle up to the neck with pure milk; add two tablespoonfuls of white sugar, after dissolving the same in a little water over a hot fire; add also a quarter of a two cent cake of compressed yeast. Then tie the cork on the bottle securely, and shake the mixture well; place it in a room of the temperature of 50° to 95° Fahrenheit for six hours, and finally in the ice box overnight. Drink in such quantities as the stomach may require. Be sure that the milk is pure; that the bottle is sound; that the yeast is fresh; to open the mixture in the morning with great care, on account of its effervescent properties; not to drink it at all if there is any curdle or thickening part resembling cheese, as this indicates that the fermentation has been prolonged beyond the proper time.

2. To a qt. of new milk add a sixth part of water, and to this mixture add, as a ferment, an eighth part of the sourest buttermilk that can be got. In future preparations, a similar quantity of old koumiss will better answer the purpose of a ferment. Cover the vessel with a cloth, and allow to stand in a place of moderate warmth for twenty-four hours, when a thick substance will be found collected at the top. Stir well until this substance is thoroughly mixed with the liquid portion beneath, and allow to stand for twenty-four hours more, when, having filled a bottle two-thirds full, and again thoroughly mixed by shaking, the preparation, now called koumiss, may be used at once, or the bottle tightly corked and kept in a cool place for future use. Always shake the bottle well before using.

3. Dilute the milk with one-sixth part of hot water, and, while still tepid, add one-eighth of very sour (but otherwise good) buttermilk. Put it into a wide jug, cover with a clean cloth, and let stand in a warmish place (about 75° Far.) for twenty-four hours; stir up well, and leave for another twenty-four hours. Then beat thoroughly together, and pour from jug to jug till perfectly smooth and creamy. It is now still koumiss, and may be drunk at once. To make it sparkling, which is generally preferred, put it into champagne or soda-water bottles; do not quite fill them, well secure the corks, and lay down in a cool cellar. It will then keep for six or eight weeks, though it becomes increasingly acid. To mature some for drinking quickly, it is as well to keep a bottle or two to start with in some warmer place, and from time to time shake vigorously. With this treatment it should, in about three days, become sufficiently effervescent to spurt freely through a champagne tap, which must be used for drawing it off as required. Later on, when very frothy and acid, it is more pleasant to drink if a little sweetened water (or milk and water) is first put into the glass. Shake the bottle, and hold it inverted well into the tumbler before turning the tap. Having made one lot of koumiss as above, you can use some of that instead of buttermilk as a ferment for a second lot, and so on five or six times in suc-

cession; after which it will be found advisable to begin again as at first. Mare's milk is the best for koumiss; then ass's milk. Cow's milk may be made more like them by adding a little sugar of milk (or even loaf sugar) with the hot water before fermenting. But perhaps the chief drawback to cow's milk is that the cream separates permanently, whereas that of mare's milk will remix. Hence use partially skimmed milk, for if there is much cream it only forms little lumps of butter, which are apt to clog the tap, or are left behind in the bottle.

Kraft's Alloy. See **Alloys.**

Kustitlen's Metal. See **Alloys.**

Kyanizing. See **Wood, Preservation of.**

Labels for Bottles. See **Bottles.**

Labels, Cements for. See **Cements.**

Labels, Enamel for. See **Enameling.**

Labels, Garden, to Preserve. See **Wood, Preservation of.**

Labels, Paper, for Glass Bottles.—These will last as long as glass if they are covered with egg albumen, and then exposed to the action of steam until the albumen coagulates. If they are now dried in a temperature of 212° F., the albumen will become hard and clear, and oils or acids will not affect them.

Labels, Glue for. See **Glues.**

Labels, Insoluble.—Lay a coat of strained white of egg over the label, and immediately put the vessel in the upper portion of a common steam pan, or otherwise expose it to a gentle heat till the albumen coagulates and turns opaque, and then take it out and dry it in an oven, at a heat of about 212° F.; the opaque white film will then become hard and transparent, and resist the action of oils, spirits and water. (Chem., iii., 158.) The labels on bottles containing acids or alkaline solutions, should be either etched upon the glass by fluoric acid or be written with incorrodible ink.

Labels, Paste for. See **Pastes.**

Labels, Plant.—Common lead pencil on zinc labels are almost indelible and become more distinct with age.—Chloride of platinum solution, and better, sulphate of copper, may be used, and are perhaps somewhat more distinct.

Labels, Wooden, to Preserve.—1. Thoroughly soak labels in iron sulphate, then lay them, after they are dry, in lime water.

2. The following method of preserving wooden labels that are to be used on trees or in exposed places is recommended: Thoroughly soak the pieces of wood in a strong solution of sulphate of iron; then lay them, after they are dry, in lime water. This causes the formation of sulphate of lime, a very insoluble salt, in the wood. The rapid destruction of the labels by the weather is thus prevented. Bast, mats, twine and other substances used in tying or covering up trees and plants, when treated in the same manner, are similarly preserved. At a recent meeting of a horticultural society in Berlin wooden labels, thus treated, were shown, which had been constantly exposed to the weather during two years without being affected thereby.

Labels, Zinc, Garden.—For zinc plates, use with quill pens only. 1. Dissolve muriate of ammonia and crude sal ammoniac in strong vinegar. 2. For large labels, dip your pen in concentrated sulphuric acid, and write on the zinc, previously greased; a sharp point of copper wire is better than the pen; quench in water; wash thoroughly from fluid when your writing is plain enough. 3. Dissolve about seventy-five cents' worth of chloride of platinum in hot distilled water, adding a very few drops of aqua regia. The liquid should be of a pale amber color; enough for hundreds of labels.

Labarraque's Solution.—

Chloride of lime	2 oz.
Carbonate of soda	4 oz.
Water	40 oz.

Mix the chloride of lime with 30 oz. of the water, and dissolve the carbonate of soda in the remainder. Mix, boil and filter.

Lac, to Bleach. See **Bleaching.**

Laces, to Wash. See **Cleansing.**

Lace, Gold, to Clean. See **Cleansing.**

Lacto-Pepsin.—Milk sugar, 60 oz.; pepsin, 12 oz.; pancreatine, 9 oz.; vegetable ptyalin (diastase), 6 drm.; lactic acid, 7½ drm.; hydrochloric acid, 7½ drm. Used for dyspepsia.

Lactose Tonic, for Dispensing.—To 1 gal. of sirup add from 2 to 3 oz. of sugar of milk. Flavor to taste.

Lacquering.—The following receipts for lacquers are arranged as nearly as possible in alphabetical order:

Lacquering Brass.—1. Be sure there is no oil or grease on the brass; do not touch the work with the fingers, hold it with spring tongs or a taper stick in some of the holes.

2. Always handle with a piece of clean cloth.

3. Heat the work so hot that the brush will smoke when applied, but avoid overheating, as it burns the lacquer.

4. It is well to fasten a small wire across the lacquer cup, from side to side, to scrape any superfluous lacquer. The brush should have the ends of the hairs all exactly even. If not so, trim the ends with sharp scissors.

5. Scrape the brush as dry as possible on the wire, making a flat, smooth point at the same time.

6. Use the very tip of the brush to lacquer with, and carry a steady hand.

7. Put on at least two coats. It is well (to make a very durable coat) to blaze off after each coat with a spirit lamp or Bunsen burner, taking care not to overheat and burn the lacquer.

8. If the lacquer is too thick, it will look gummy on the work. If too thin, it will show prismatic colors. In the first case, add a little alcohol; in the latter, set the cup on the stove and evaporate some.

9. A good deal of cheap work, like lamp burners, is dipped. Use a bath of nitric and sulphuric acids, equal parts, dip work, hung on wire, into acid for a moment, remove, rinse in cold water thoroughly, dip in hot water, remove, put in alcohol, rinse around, then dip momentarily in lacquer, shaking vigorously on removing to throw off extra lacquer and lay on a warm metal plate till dry, let cool, and it is done.

10. Avoid handling lacquered work until cold.

Cleaning and Relacquering Brass Chandeliers.—You, of course, know everything depends upon having the brasswork free from grease or dirt. Unless you are very careful on this point you will never get the work a good color. Perhaps the better way for you to accomplish what you want will be to boil the brass parts in a strong solution of pearlash until apparently clean, then place them into a vessel containing a solution of aquafortis, about one of acid to three or four of water; let them remain in this solution for an hour or so, afterward washing them well, and scouring, if necessary, with sand until every part is clean, then make up a solution of equal parts of nitric and sulphuric acids, and add to it about one-third part extra of nitric acid, having zinc dissolved in it in the proportion of about one zinc to three acid. When boiling dip the articles in until they have the color you require; twenty to thirty seconds will be ample. Then swill well in plenty of water, and place all the parts in fine sawdust until dry. When dry you can rub up with soft rags and a leather, and when just too hot to hold, lacquer the whole of the parts that will be at

all exposed. When going through the process above, take care not to handle any of the brasswork; and above all, do all the work out of doors, or in a place with a large chimney, to take away any fumes of nitrous acid, which are most deleterious to the lungs.—*W. J. Lancaster, in English Mechanic.*

To Relacquer Brass.—The *English Mechanic* gives the following receipt: Strong sulphuric acid, 2 parts; water, 1 part; red fuming nitrous acid, 1 part. These must be mixed in the open air, as the gas evolved on mixing the nitrous acid with the vitriol and water is of a suffocating character; this will pass off in the course of an hour or so, during which time the mixture may be occasionally stirred with a glass rod. The bright, gilded effect produced on the brass by this mixture is so good that any one trying it will not return to the use of nitric acid. The subsequent washing, drying and lacquering cannot be done too soon after the dipping, as the articles tarnish rapidly if kept unlacquered.

Lacquering Instruments. — Clean the brass work of instruments by boiling in caustic soda water if convenient, otherwise soak in alcohol and wipe. For aluminum lacquer, dissolve bleached shellac in the best, or 95% alcohol. Heat all work to about 212° F. before lacquering use a broad camel's hair brush, work quickly and place the work in a hot oven or over a spirit-lamp for a few minutes, to glaze the surface of the lacquer. To deaden the gloss on instrument work: Clean perfectly free from grease with soda water, rinse, and dip in a bath of nitric acid, 1 part; water, 4 parts; for from two to five seconds; rinse off the acid in hot water, dip again in hot soda water and in hot clean water to leave the surface perfectly free from acid. Dry in sawdust. Color lacquers with dragon's blood and saffron to the required depth.

Lacquering Instrument.—Have your lacquer in jar, with wire across top; this is to squeeze on all surplus from brush; this must be rubbed clean now and then to keep from clogging. Do not make brasswork hot, but warm till the steam or sweat disappears. The rich color is got by putting on successive coats and warming between each. Do not try to do this in one operation, and so lay it on too thick. Hold brush between finger and thumb of right hand, and apply lacquer by light feather strokes. Suitable holders should be made for round work, terminals, etc., whereby they can be twisted round between finger and thumb of left hand. If you make work too hot, lacquer will turn brown and have to be washed off; this can be done with spirit, or work left in strong solution of soda overnight. Brushes should be of soft camel hair, flat, and trimmed on a board with sharp knife to a thin, straight edge. A good brush is half the battle. If these get hard, press on hot iron plate, and then dip in lacquer, when they will be in nice working order.

Materials for Lacquering.—

The lacquer = shellac + alcohol.

Other substances	{	Turpentine, spirits of.
		" varnish.
A.....	{	Mastic varnish.
		Canada balsam.
B		Pyro-acetic ether.
C = red.....	{	Dragon's blood.
		Annatto.
		Red sanders.
D = yellow	{	Turmeric.
		Gamboge.
		Saffron.
		Sandarac.
		Cape aloes.

Lacquer, Directions for Making.—Mix the ingredients and let the vessel containing them stand in the sun, or in a place slightly warmed, three or four days, shaking it frequently till the gum is dissolved, after which let it settle from twenty-four to forty-eight hours, when the clear liquid may be poured off for use. Pulverized glass is sometimes used in making lacquer, to carry down the impurities.

Amber and Elemi Lacquer.—Amber, 4 parts; elemi, 1 part; Venice turpentine, 1 part; oil of turpentine, 12 parts. This makes a very beautiful and lasting lacquer.

Lacquer, Bookbinders.—1. Dissolve on a water bath 180 parts of shellac, 1 part of camphor, 1 part loaf sugar in 1,500 parts of alcohol of 66%. Filter through blotting paper, distill off ⅓ the alcohol, add while warm a very little oil of cinnamon or oil of cloves.

2. Parisian Bookbinders' Lacquer.—Shellac, 180 parts; camphor, 1 part; loaf sugar, 1 part; alcohol of 66%, 1,500 parts. Filter the solution. Distill off ⅓ the alcohol. Add a trace of oil of almonds.

Lacquers for Brass.—1. Seed lac, dragon's blood, annatto, and gamboge, each 4 oz.; saffron, 1 oz.; alcohol, 10 pt.

2. Turmeric, 1 lb.; annatto, 2 oz.; shellac and gum juniper, each 12 oz.; alcohol, 12 oz.

3. Seed lac, 6 oz.; dragon's blood, 40 grn.; amber and copal triturated in a mortar, 2 oz.; extract of red sanders, ½ drm.; Oriental saffron, 36 grn.; coarsely powdered glass, 4 oz.; absolute alcohol, 40 oz. Very fine.

4. Seed lac, 3 oz.; amber and gamboge, each 2 oz.; extract of red sanders, ½ drm.; dragon's blood, 1 drm.; saffron, ½ drm.; alcohol, 2 pt. 4 oz.

5. Turmeric, 6 drm.; saffron, 15 grn.; hot alcohol, 1 pt.; draw the tincture and add: Gamboge, 6 drm.; gum sandarac and gum elemi, each 2 oz.; dragon's blood and seed lac, each 1 oz.

6. Alcohol, 1 pt.; turmeric, 1 oz; annatto and saffron, 2 drm. each. Agitate frequently for a week, filter into a clean bottle, and add seed lac, 3 oz. Let stand, with occasional agitation, for about 2 weeks.

7. Gamboge, ½ oz.; aloes, 1½ oz.; shellac, fine, 8 oz.; alcohol, 1 gal.—*Sci. Am.*

8. Put 3 oz. seed lac, 2 drm. dragon's blood, and 1 oz. turmeric powder into 1 pt. alcohol. Let the whole remain for 14 days; but during that time agitate the bottle once a day at least. When properly combined, strain the liquid through muslin, when it is ready for use.

9. To 5 oz. alcohol add gamboge enough to give a bright yellow color, and 3 oz. seed lac in fine powder. Put in sand bath till dissolved.

10. Ground turmeric, as sold, 1 oz.; saffron and Spanish annatto, each 2 drm.; highly rectified alcohol, 1 pt. Place them in a moderate heat, shaking occasionally for several days; then add 3 oz. good seed lac, roughly powdered; shake occasionally until the lac is dissolved. If a deep orange lacquer is required, increase the quantity of annatto; if a bright yellow, decrease it. Lay it on with a brush (warm), like you would paint. One or more coats, if necessary. Avoid using too much seed lac, as it has a tendency to prevent the lacquer lying evenly.

11. Pale gold lacquer is best for microscope; be sure and get the best quality and see that the things are sufficiently hot before putting on the lacquer; heat after lacquering, and it will stand well. Damp will affect the best lacquering.

12. 3 is the best for optical work. If it comes off, either the metal was not clean when applied or else it was put on cold. The metal should be heated to just such a point that it dries as fast as the brush passes over it. Work is often spoiled in lacquering. Circular things may be done in the lathe, going quite slow, and working a good body by going over several times.

13. In preparing brass for the colorless or nearly colorless lacquer, the goods, after being annealed, pickled, scoured and washed, are either dipped for an instant in pure commercial nitric acid, washed in clear water, and dried in sawdust, or immersed in a mixture of 1 part of nitric acid with 4 parts of water, till a

white curd covers the surface, at which moment the goods are withdrawn, washed in clear water and dried in sawdust. In the first case, the brass will be bright; in the latter, a dead flat, which is usually relieved by burnishing the prominent parts. Then the goods are dipped for an instant in commercial nitric acid, and well washed in water containing argol, to preserve the color till lacquered, and dried in warm sawdust. So prepared, the goods are heated on a plate and varnished. The varnish used is one of spirit, consisting, in its simple form, of 1 oz. shellac dissolved in 1 pt. alcohol. To this simple varnish are added such coloring substances as red sanders, dragon's blood and annatto, for imparting richness of color. To lower the tone of color, turmeric, gamboge, saffron, Cape aloes, and sandarac are used. The first group reddens, the second yellows the varnish; while a mixture of the two gives a pleasing orange, and various tints can be got by suitable mixtures.

dragon's blood and turmeric to produce the desired color.

2. For ornaments bronzed with gold colored bronze, paint the articles, of cast iron, with white paint, which is white lead and oil; when hard dry, varnish with copal varnish; when sticky dry, dust the bronze powder over it; and when hard dry, brush off all the superfluous bronze with a camel's hair brush. To protect it from the dust and from soiling, coat the bronze surface, when thoroughly dry, with spirit copal varnish.

Chinese Lacquer Work.—Chinese lacquer work is done over tin foil, and consists of a mixture of 2 parts of copal, and 1 part of shellac, melted together. When fluid, there are added 2 parts of boiled linseed oil; and, after the vessel containing this mixture has been taken from the fire, there are gradually added 10 parts of oil of turpentine. If color is required, gum guttæ (or gamboge), dissolved in oil of turpentine, yields yellow; and dragon's

Table of Lacquers.

				Solutions.					Reds.			Yellows.					
	Shellac.	Mastic.	Canada Balsam.	Alcohol.	Pyro-acetic Ether.	Spirits of Turpentine.	Turpentine Varnish.	Simple Pale Lacquer.	Dragon's Blood.	Annatto.	Sanders.	Turmeric.	Gamboge.	Saffron.	Cape Aloes.	Sandarac.	
No.	oz.	dr.	dr.	pt.	oz.	dr.	oz.	pt.	dr.	dr.	gr.	dr.	dr.	dr.	dr.	dr.	
1	4	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	Strong simple.
2	1	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	Simple pale.
3	1	....	....	1	....	....	....	....	....	....	....	....	1	....	3	....	Fine pale.
4	1	....	....	1	....	....	....	....	....	....	....	1	1	2	....	....	Fine pale.
5	1	....	....	2	....	....	....	....	1	1	....	....	16	4	....	8	Fine pale.
6	2	....	....	2	....	....	....	....	1	8	....	32	....	....	....	8	Pale gold.
7	2	....	....	1	....	....	....	....	....	....	....	....	2	....	4	....	Pale yellow.
8	5	....	....	3	30	....	....	....	....	....	....	....	5	....	....	....	Pale yellow—(Ross's.)
9	....	....	....	....	....	....	....	1	....	1	....	4	....	....	....	....	Full yellow.
10	3	....	....	1	....	....	....	....	....	2	....	16	....	2	....	....	Gold.
11	3	....	....	4	....	....	6	....	....	....	....	64	6	....	..	14	Gold.
12	1	....	....	1	....	....	....	....	....	....	....	20	....	....	2	5	Gold.
13	3	....	....	1	....	....	....	....	4	....	....	16	....	....	....	....	Deep gold.
14	3	....	....	1	....	....	....	....	4	....	....	1	....	....	....	....	Deep gold.
15	3	....	....	1	....	30	....	....	40	....	12	10	....	....	....	....	Deep gold.
16	..	....	....	....	....	....	....	1	8	32	....	....	..	....	....	....	Red.
17	1	....	....	....	....	....	1	....	8	24	....	....	....	....	....	27	Red.
18	15	30	30	6	....	....	....	....	20	....	....	60	....	10	....	....	Tin lacquer.
19	....	....	....	....	....	....	....	1	....	....	....	4	1	....	....	....	Green, for bronze.

The union of red with yellow produces a fine orange color. dr. = drachm; gr. = grain.

Lacquer, for Dipped Brass.—Alcohol, proof specific gravity not less than ninety-five one-hundredths, 2 gal.; seed lac, 1 lb.; gum copal, 1 oz.; English saffron, 1 oz.; annatto, 1 oz.

Lacquer, Gold Colored, for Brass not Dipped.—Alcohol, 4 gal.; turmeric, 3 lb.; gamboge, 3 oz.; gum sandarac, 7 lb.; shellac, 1½ lb.; turpentine varnish, 1 pt.

Lacquer, for Bronzed Brass.—To 1 pt. of the above lacquer, add gamboge, 1 oz.; and after mixing it, add an equal quantity of the first lacquer.

Lacquer, Gold Colored for Dipped Brass.—Alcohol, 36 oz.; seed lac, 6 oz.; amber, 2 oz.; gum gutta, 2 oz.; red sandal wood, 24 grn.; dragon's blood, 60 grn.; Oriental saffron, 36 grn.; pulverized glass, 4 oz.

Bronze Lacquers.—1. To make a bronze lacquer, dissolve ¾ lb. shellac and ½ lb. sandarac in 3 qt. alcohol, and add enough extract of blood, dissolved in the same liquid, yields red.

Colorless Lacquer.—For a colorless lacquer dissolve bleached shellac in pure alcohol, settle and decant. Make the lacquer very thin. The usual lacquer for brass is made with ordinary shellac and alcohol made very thin, settled and decanted.

2. Mastic, 5 parts; amber, 5 parts; sandarac, 10 parts; shellac, 10 parts; alcohol, 100 parts.

Color for Lacquer.—Alcohol 1 pt.; annatto 2 oz.

Combmakers' Lacquer.—Elemi and mastic, 1 part of each; shellac, 5 parts; strong alcohol, 20 parts.

Copper Plates, Lacquer for.—Camphor and mastic, 6 parts of each; sandarac and shellac (bleached), 15 parts of each, strong alcohol, 200 to 250 parts.

Lacquer for Copper.—Mastic, 8 parts; camphor, 6 parts; sandarac, 15 parts; shellac (bleached), 15 parts; alcohol, 40 parts.

Lacquer of Drawings.—Dammar, 45 parts, dissolved in 270 parts of acetone; mix 60 parts of this solution with 45 parts of thickly fluid collodion.

Lacquer, Elastic.—Thirty parts of lime slaked with 40 parts of water. Add while the lime is warm, 100 parts melted unvulcanized rubber. The lacquer is in form of a paste when cold. Apply it warm.

Floors, Lacquer for.—Rosin, 2 parts; red shellac, 4 parts; Venice turpentine, 1 part; strong alcohol, 20 parts.

Glossy Lacquer.—This is a popular and very useful lacquer: amber, 1 part; copal, 2 parts; seed lac, 3 parts; mastic, 3 parts; sandarac, 3 parts; shellac, 5 parts; Venice turpentine, 2 parts; strong alcohol, 50 parts.

Gold Lacquers.—1. Pale lac in grains, gamboge, dragon's blood, and annatto, each 1½ oz.; saffron, 3¼ oz. Each gum is dissolved separately in 5 pt. alcohol, and the annatto and saffron are separately infused in a like quantity of alcohol. The ingredients are mixed to form any particular tint desired. Turmeric (ground), 1 lb.; alcohol, 2 gal.; macerate for one week, strain by expression, and add gamboge, 1½ oz.; pale shellac, ¾ lb.; gum sandarac, 3½ lb. Strain, and add turpentine varnish, 1 qt. Other lacquers are prepared in a similar way from alcohol and shellac, a solution of the coloring ingredients, as dragon's blood, gamboge etc., being kept on hand, and added to produce any requierd tint.

2. Two parts seed lac, 4 parts sandarac, 4 parts elemi, 40 parts alcohol. Alcoholic solution of gamboge and dragon's blood, or fuchsin, picric acid, Martin's yellow, and coralline, are separately prepared, and added to the above in quantities ascertained by trial to impart the desired color. To remove the marks left by the brush, and to impart luster, the varnish, after drying, is polished. This is effected by first rubbing with powdered pumice and water, and next with an oiled rag and tripoli, until the desired polish is produced; the surface is afterward dried with a soft linen cloth; any greasiness is removed by means of powdered starch, and the process is finished by rubbing with the hand. Great care must be taken that the surface to which varnish is applied be free from grease or smoke, which prevents all oil varnish from drying.

3. Turmeric, 1 drm.; gamboge, 1 drm.; oil of turpentine, 2 pt.; shellac, 5 oz.; gum sandarac, 5 oz.; dragon's blood, 7 drm.; thin mastic varnish, 8 oz. Digest with occasional agitation for fourteen days in a warm place, then set aside to fine, and pour off the clear.

4. Dissolve gum lac in 90% alcohol.

5. One lb. ground turmeric, 1½ oz. ground gamboge, 3 lb. ground gum sandarac, 1 lb. ground shellac (bleached), 2 gal. alcohol, 3 pt. turpentine varnish. Put the whole in a suitable vessel, cork close, and agitate until dissolved.

6. One gal. methylated spirits of wine, 10 oz. seedlac, bruised, and ½ oz. red sanders; dissolve and strain.

7. A gold lac, remarkable for its great hardness and beautiful color, on being analyzed by Dr. R. Kayser, at Nuremberg, gave as its constituents picric acid and boracic acid. Thereupon a clear shellac solution was mixed with picric acid and about ½% crystallized boracic acid, each being previously dissolved in alcohol, and the resulting lac possessed all the advantages of the former one.

Green Lacquer.—Turmeric, 18 oz.; shellac, 15 oz.; gum sandarac, 1 oz.; gum elemi, 3 oz.; gamboge, 3 oz.; methylated spirits, 3 gal.; expose to gentle heat. After straining, add 1½ gal. spirit to the sediment, and treat as before.

Harness Lacquer.—Dissolve 8 parts shellac, 20 parts sandarac, and 10 parts mastic in 1,000 parts alcohol.

High Colored Lacquer.—2 qt. spirits of wine, 2½ oz. shellac, 2 oz. gum sandarac, ½ oz. gum elemi; mix and keep gently warmed for two or three days; strain, color with dragon's blood to taste, and thin with 1 qt. 90% alcohol.

Iron, Lacquer for.—1. Asphaltum, 10 parts; resin, 3 parts; lampblack, 1 part; petroleum, 25 parts.

2. Twelve parts amber, 12 parts turpentine, 2 parts resin, 2 parts asphaltum, 6 parts drying oil.

3. Three lb. asphaltum, ½ lb. shellac, 1 gal. turpentine.

Lacquer for Bright Iron Work.—Litharge, 4½ parts; boiled linseed oil, 64½ parts; white lead in oil, 9 parts; pulverized resin, 2½ parts. Add the litharge to the oil, and let it simmer for about three hours over a moderate fire; strain, and add the resin and white lead. Let it remain at a gentle heat until the resin is dissolved.

Linseed Oil and Caoutchouc Lacquer.—Six lb. of caoutchouc is swelled in 3 lb. ether and rendered fluid by heating; 3 lb. linseed oil and 3 lb. oil of turpentine are then added; these oils must be warm when added.

Matt Lacquer.—This is sometimes called mattolein. Dissolve 30 parts of sandarac and 7 parts of mastic in 320 parts of ether, and add 100 to 200 parts benzine. The more added the coarser will be the grain.

Sheet Metal, Lacquer for.—Asphaltum, 5 parts; colophony, 3 parts; oil of turpentine varnish (see varnishes), 10 parts; oil of turpentine, 14 parts.

Metallic Surfaces, Lacquering.—Following are miscellaneous recipes for lacquering metallic surfaces of all kinds:

For gold: 1 gal. alcohol, ½ lb. turmeric; macerate for a week, then filter and add 2 oz. gamboge, 6 oz. shellac, 1¾ lb. gum sandarac; dissolve in warm bath and add 1 qt. common turpentine varnish. For red lacquer use 1½ lb. annatto instead of the turmeric and 8 oz. dragon's blood instead of the gamboge.

2. Pale: Alcohol, 8 oz.; turmeric, 4 drm.; dragon's blood, 4 scr.; red sanders, 1 scr.; hay saffron, 2 scr.; shellac, 1 oz.; gum sandarac, 2 drm.; gum mastic, 2 drm.; Canada balsam, 2 drm.; dissolve and add 1½ drm. of spirits of turpentine.

3. The following is an excellent lacquer for brass: Seed lac, 12 oz.; copal, 4 oz.; dragon's blood, 80 grn.; extract of red sanders wood, 50 grn.; saffron, 70 grn.; pounded glass, ½ lb.; alcohol, 2 qt. This is very durable.

4. Pale: One gal. methylated alcohol, 5 oz. shellac, 4 oz. gum sandarac, and 1 oz. gum elemi; mix in a tin flask and expose to a gentle heat for a day or two; then strain off and add ½ gal. spirit to the sediment and treat as before.

5. Pale gold: One gal. methylated alcohol, 10 oz. seed lac bruised, and ½ oz. red sanders; dissolve and strain.

6. A paste is made of finely pulverized quartz, carbonate of potash (or oxide of lead) and water, according to the color required. A thin coat of this is applied with a brush to the object, which is then placed in a muffle and heated to 1,495° F. (811° C.). The articles emerge covered with a sort of polished glass which resists blows, and which does not split nor scale off, while it serves perfectly to protect the metal against oxidation.

7. Petroleum essence, 1 lb.; boiled linseed oil, ½ lb.; to be mixed cold. Metallic plates prepared for lithography, etc., are brushed over with this varnish (applied cold); when dried by heating it has a golden yellow tint.—*Bul. Soc. Chim.*

8. Green Varnish for Metals.—Finely pulverized gum sandarac or mastic (the latter, however, is too expensive for some uses), is dissolved in strong potash lye until it will dissolve no more. The solution is diluted with water, and precipitated with a solution of a copper salt, either sulphate or acetate. This green precipitate is washed, dried and dissolved in oil of turpentine, producing a fine green varnish

which does not change under the effect of light, and will be especially useful for ornamental iron work.—*Industrie Blatter.*

9. Green Transparent Varnish.—Grind a small quantity of Chinese blue with double the quantity of finely powdered chromate of potash (it requires most elaborate grinding); add a sufficient quantity of copal varnish thinned with turpentine. The tone may be altered by more or less of one or the other ingredients.

10. Green Bronze Liquid.—One qt. strong vinegar, ½ oz. mineral green, ½ oz. raw umber, ½ oz. sal ammoniac, ½ oz. gum arabic, 2 oz. French berries, ½ oz. copperas; dissolve the whole in a pipkin over a gentle fire, allow to cool and then filter.

11. Green Lacquer.—Mix 5 oz. shellac, 6 oz. turmeric, 4 oz. gum sandarac and 1 oz. each gum elemi and gum gamboge in 1 gal. methylated spirits; expose to gentle heat, strain, add ½ gal. spirit to the sediment and treat as before.

12. Gold Colored Lacquer for Brass Watch Cases, etc.—6 oz seed lac, 2 oz. amber, 2 oz. gamboge, 24 grn. extract of red sanders wood in water, 60 grn. dragon's blood, 36 grn. oriental saffron, 4 oz. powdered glass, 36 oz. pure alcohol. The seed lac, amber, gamboge and dragon's blood must be pounded very fine on porphyry or clean marble and mixed with the pounded glass. Over this mixture is poured the tincture formed by infusing the saffron and the sanders wood extract in the alcohol for 24 hours, then straining. Metallic articles that are to be covered with this varnish are heated, and, if they admit of it, immersed in packets.

13. For philosophical instruments: 1½ oz. gamboge, 4 oz. sandarac, 4 oz. elemi, 2 oz. best dragon's blood, 1½ oz. terra merita [terra merita is the root of an Indian plant; it is of a red color and much used in dyeing; in varnishing it is only employed in the form of a tincture, and is particularly well adapted for the mixture of those coloring parts which contribute the most toward giving metals the color of gold; in choosing it, be careful to observe that it is sound and compact], 4 grn. oriental saffron, 2 oz. seed lac, 6 oz. pounded glass, 40 oz. pure alcohol. The dragon's blood, gum elemi, seed lac and gamboge are all pounded and mixed with the glass. Over them is poured the tincture obtained by infusing the saffron and terra merita in the alcohol for 24 hours. This tincture, before being poured over the dragon's blood, etc., should be strained through a piece of clean linen cloth and strongly squeezed. If the dragon's blood gives too high a color, the quantity may be lessened, according to circumstances. The same is the case with the other coloring matters. This lacquer has a very good effect when applied to many cast or moulded articles used in ornamenting furniture.

Pale Lacquer.—1 gal. of methylated alcohol 5 oz. of shellac, 4 oz. of gum sandarac and 1 oz. of gum elemi; mix in a tin flask and expose to a gentle heat for a day or two, then strain off and add ½ gallon of spirit to the sediment and treat as before.

Philosophical Instruments, Lacquer for.—Take ¾ oz. of gum guttæ (or gamboge), 2 oz. of gum sandarac, 2 oz. of gum elemi, 1 oz. of dragon's blood, 1 oz. of seed lac, 2 grn. of oriental saffron, and 20 oz. of pure alcohol. The tincture of saffron is obtained by infusing in alcohol for twenty-four hours or exposing to the heat of the sun in summer. The tincture must be strained through a piece of clean linen cloth and ought to be strongly squeezed. This tincture is poured over the dragon's blood, the gum elemi, the seed lac and the gum guttæ, all pounded

Photographs, Lacquer for.—Dissolve 1 oz. of dammar in 6 oz. of acetone. Apply several times.

Resin, Lacquer.—Asphaltum, 1 part; rosin, 4 parts; oil of turpentine, 2 parts: linseed oil varnish, 3 parts.

Spirit Lacquer, for Lacquering Wax Tapers.—Mastic, 40 parts; sandarac, 400 parts. Place these articles in a fine sieve and suspend the sieve in a vessel containing 960 parts of alcohol of 96%, so that the resins will be just covered with the alcohol. When the resins are dissolved, which will be in about twenty-four hours, filter.

Leather, Black Lacquer for.—Red shellac, 6 parts; ½ part each of Venice turpentine, castor oil and sandarac, 30 parts strong alcohol and 1 part of nigrosine.

Leather, Cheap Lacquer for.—Twenty-three parts of black pitch are made into a solution with the aid of 69 parts of benzole and 8 parts of turpentine are added

Terra Cotta, Lacquer for.—Mastic, 1 part; shellac, 10 parts; Venice turpentine, 3 parts; 20 parts strong alcohol.

Lacquer, Pale Tin.—Strongest alcohol, 4 oz.; powdered turmeric, 2 drm.; hay saffron, 1 scruple; dragon's blood, in powder, 2 scruples; red sanders, ½ scruple. Infuse this mixture in the cold for forty-eight hours, pour off the clear and strain the rest; then add powdered shellac, ½ oz.; sandarac, 1 drm.; mastic, 1 drm.; Canada balsam, 1 drm. Dissolve this in the cold by frequent agitation, laying the bottle on its side to present a greater surface to the alcohol. When dissolved add 40 drops of spirit of turpentine.—*Science Record, 1874.*

Gold Lacquer for Tin Plate.—Clean the tin plate carefully and apply the following mixture with a brush: Dark copal lacquer, 3 parts; linseed oil, 1½ parts. Dry the plates. The lacquer will not crack or lose its luster if the tin plates are bent or hammered.

Tin Plate, Lacquer for.—1. Alcohol, 12 oz.; turmeric, 6 drm.; saffron, 3 scruples; sandarac, 3 drm.; Canada balsam, 3 drm.; mastic, 3 drm. When dissolved, add oil of turpentine, 120 minims.

2. Alcohol, 1 qt.; shellac, 4 oz.; red sanders, 1 oz.; turmeric, 2 oz. Shake frequently for twenty-four hours, and bottle. Various colors can be given to the lacquer by adding Prussian blue, lakes, etc.

3. Use as a body shellac or gum sandarac varnish. To make it adhere, add to it ½ part boracic acid to 1,000 parts lacquer. Color with suitable pigments, such as gamboge, Prussian blue or carmine. Aniline colors may be used, but tend to fade. Excellent results may be attained by adding a little castor oil, which makes the lacquer much tougher.

4. Red, for Tinware.—Put 3 oz. seed lac and 2 drm. aniline, color of shade to suit, into 1 pt. well rectified spirits Let the whole remain for fourteen days, but during that time agitate the bottle once a day at least. When properly combined, strain the liquid through muslin.

Lacquer for Steel.—Pure mastic, 8 parts; camphor, 4 parts; sandarac, 12 parts; elemi, 4 parts. Dissolve in pure alcohol; filter. Use the lacquer cold. It will be clear and transparent when dry.

Lacquer for Tinfoil.—Alcohol, 1½ qt.; shellac, 10½ oz. Dissolve the shellac in the alcohol and filter. Prevent the evaporation of the alcohol as much as possible. Add to this shellac varnish, 5¼ oz. best white gum elemi and 21 drm. Venetian turpentine. Let this mixture stand in a warm place; stir it frequently. Filter; press out the remainder, and add to the filtrate. This varnish may be colored if desired.

Tools, Lacquer for.—The tools must be cleaned and polished so as to be absolutely free from grease. They are next slightly warmed and varnished with a solution of seed lac or shellac in alcohol. The success of the operation depends on the clearness of the surface. A finger touch before varnishing will affect the finish.

Turner's Lacquer.—Gum elemi, 4 parts; shellac (bleached), 20 parts; Venice turpentine, 4 parts; strong alcohol, 60 parts.

A Universal Lacquer which is equally good for paper, metal, wood, glass, etc., and which

admits of being colored with any aniline dye soluble in alcohol, is, according to *Oel und Fett Industrie*, prepared as follows: Bleached shellac, 60 grn.; manila copal (freshly powdered), 60 grn.; and gum mastic, 60 grn., is mixed with 1 kg. alcohol of 92 to 95%, a small quantity of coarsely powdered glass added, and the whole left to stand for eight to fourteen days, frequently shaking; 1 grn. boracic acid is then added, and the mixture filtered.

Wall Paper, Lacquer for.—Equal parts of borax and shellac are dissolved in ten times their weight of alcohol; strain, and give two coats. For a very light colored paper use sandarac instead of shellac. Paper treated with this lacquer can be washed with water, and even with soap, if necessary.

Wax Lacquer.—White wax, 2 parts; benzol, 3 parts.

Wood, Lacquer for.—Five parts each of mastic, sandarac, elemi, seed lac and bone black; 10 parts of shellac; dissolve in 100 parts of alcohol.

Zapon.—This is manufactured at Short Hills, N. J. This splendid lacquer is probably a solution of celluloid in amyl acetate and aceton (proportions unknown). It can be bent without breaking. It can be washed and affords a perfect protection to the metal. It should be procured of the maker. J. Carbutt, of Wayne Junction, Pa., furnishes a varnish called Roxyline, which is also very useful in metal working, though intended especially for photographic use. It is probably a solution of celluloid in fusel oil.

Zinc, Lacquer for.—A good lacquer consists of alcohol, 8 oz.; gamboge, 1 oz.; shellac, 3 oz.; annatto, 1 oz.; solution of 3 oz. of seed lac in 1 pt. alcohol. When dissolved, add ¼ oz. Venice turpentine and ¼ oz. dragon's blood to make it dark. Keep in warm place for four or five days.

Lactate.—A salt of lactic acid. A lactate yields large quantities of carbonic oxide gas.

Ladies' Own.—Alcohol, 90%, 2 qt.; otto of roses 10 drops; essence of thyme, ¼ oz.; essence of neroli, ⅛ oz.; essence vanilla, ¼ oz.; essence of bergamot, ⅛ oz.; orange flower water, 3 oz.

Lagging, for Steam Pipes.—Impure or second grade paper pulp mixed with Fuller's earth makes an excellent lagging for steam pipes. See **Boiler Covering.**

Lake.—Animal or vegetable coloring matter, precipitated in combination with oxide of tin or alumina, usually the latter. The term was formerly restricted to red preparations of this kind, but is now indiscriminately applied to all compounds of alumina and coloring matter. Lakes are made—

1. By adding a solution of alum, either alone or saturated with potash, to an infusion or decoction of the coloring substance, and after agitation precipitating the mixture with a solution of carbonate of potash.

2. By precipitating a decoction or infusion of the coloring substance made with a weak alkaline lye, by adding a solution of alum.

3. By agitating recently precipitated alumina with a solution of the coloring matter until the liquid becomes nearly decolored, or the alumina acquires a sufficiently dark tint.—*Cooley.*

Lakes. See **Pigments.**

Lamp Bulbs, Incandescent, to Tint.—The following is due to Mr. Arthur S. Huey, of Minneapolis:

1. Prepare the glass by thoroughly washing in soap and water and drying. Then dip in bath, made by beating up the whites of two eggs in 1½ lb. or pt. of water and filtering, and hang up to dry. Dissolve the aniline color in photographer's common collodion.

2. Red or blue aniline will form clear solutions, while the green solution will require filtering.

3. Yellow aniline forms a handsome color, but the surface of the glass presents a frosted appearance after the application.

4. Violet and purple colors may be obtained by combining red and blue in different quantities. When the solution is ready, dip the prepared glass bulbs therein, hang up to dry, and finally pass a current through the bulb for half an hour, that the heat thus generated may harden the coating of the collodion, or place in a current of air.

5. The preparation can easily be removed with alcohol or sulphuric ether, but is not affected by water. Experience has shown that the best results are obtained by not using too much aniline. Make the color light rather than deep, and apply two or three coats.

Lamps.—*The Management of Petroleum Lamps.*—In view of the numerous fatal and other accidents caused by petroleum lamps, the Metropolitan Board of Works, London, England, have issued the following suggestions as to the construction and management of such lamps, which are founded on recommendations made by Sir Frederick Abel and Mr. Boverton Redwood, chemist of the Petroleum Association, after investigating the causes of lamp accidents:

1. That portion of the wick which is in the oil reservoir should be inclosed in a tube of thin sheet metal, open at the bottom, or in a cylinder of fine wire gauze, such as is used in miners' safety lamps (28 meshes to 1 in.).

2. The oil reservoir should be of metal, rather than of china or glass.

3. The oil reservoir should have no feeding place nor opening other than the opening into which the upper part of the lamp is screwed.

4. Every lamp should have a proper extinguishing apparatus.

5. Every lamp should have a broad and heavy base.

6. Wicks should be soft and not tightly plaited.

7. Wicks should be dried at the fire before being put into lamps.

8. Wicks should be only just long enough to reach the bottom of the oil reservoir.

9. Wicks should be so wide that they quite fill the wickholder without having to be squeezed into it.

10. Wicks should be soaked with oil before being lit.

11. The reservoir should be quite filled with oil every time before using the lamp.

12. The lamp should be kept thoroughly clean, all oil should be carefully wiped off, and all charred wick and dirt removed before lighting.

13. When the lamp is lit, the wick should be at first turned down, and then slowly raised.

14. Lamps which have no extinguishing apparatus should be put out as follows: The wick should be turned down until there is only a small flickering flame, and a sharp puff of breath should then be sent across the top of the chimney, but not down it.

15. Cans or bottles used for oil should be free from water and dirt, and should be kept thoroughly closed.

The suggestions apply to ordinary mineral oil lamps, such as are generally used, and not to benzoline or spirit lamps.

Lances. See **Pyrotechny.**

Lantern Slides. See **Photography.**

Laps, to Charge with Diamond Dust.—Mix the diamond dust with good olive oil or lard oil, with one-quarter best kerosene oil added to thin and make it spread freely. Use a small iron wire flattened a little at the end like a spatula; dip in the diamond dust, and hold against the edge of the wheel. It requires very little to do the work.

Lard.—*Lard, to Prepare.*—In preparing lard for the market, it should first be cut into pieces about the size of a walnut, and these

should be allowed to stand in water for half an hour. Then work the material with the hands in five or six successive portions of water. Next pour off the water, melt the lard in a water bath, and strain through fine linen. In the first straining, it will be impossible to get rid of all the water; so that after cooling and draining, it will be necessary to remelt the lard and finally to filter it through paper in a warm closet.

Lard, to Keep Sweet.—Even during the warmest weather lard can be kept sweet by the following plan: When rendering (melting) it, throw into each kettle a handful of fresh slippery elm bark. No further preparation is necessary. No salt must be added to it at any time. The jars in which the lard is to be kept must be thoroughly cleansed.

Lard, Making.—1. Cut the fat up into pieces 2 in. square; fill a vessel holding about 3 gal. with the pieces; put in a pint of boiled lye, made from oak and hickory ashes, and strained before using; boil gently over a slow fire, until the cracklings have turned brown; strain and set aside to cool. By the above process you will get more lard, a better article, and whiter than by any other process.

2. Cleanliness is the great point in treating lard. The fat is freed from all adhering fleshy or discolored matter by cutting. It is then cut up into small pieces and washed until the water runs off clear. It is next melted by direct fire or steam coil until it becomes perfectly clear. It is run through close linen filters into the barrels, in which it is stirred until white and opaque, but only thickly fluid. The great point is when to cease stirring. It is then cooled and tightly covered. Air makes it rancid.

Lard, to Try.—This operation is very simple. Set a large kettle over a fire in some sheltered place, out of doors, on a still day. It will cook much quicker in large quantities. Put into the kettle, while the lard is cold, a little saleratus, say one tablespoonful to every 20 lb.; stir almost constantly when nearly done, till the scraps are brown or crisp, or until the steam ceases to rise, then there is no danger of its moulding; strain out into pans, and the first will be ready to empty into crocks when the last is strained.

Latitude.—Rule for finding the latitude and departure of a course when the distance and bearing are given. Latitude=length of course×cosine of bearing. Departure=length of course×sine of bearing.

Launches.—The following table gives the sizes of steam launches built by Yarrow and Hedley, of London, who make them a specialty, and build hundreds of boats for use in all parts of the world

Length of launch.	Beam.	Horse power (indicated).	Draught of water.
23 ft.	5 ft. 3 in.	5	2 ft.
30 ft.	6 ft.	7	2 ft. 3 in.
37 ft.	6 ft. 6 in.	12	2 ft. 6 in.
43 ft.	8 ft.	16	2 ft. 9 in.
50 ft.	9 ft. 6 in.	30	3 ft.

Laundry. See **Cleansing.**

Lavender, Conserve of.—Take of—

Lavender flowers (fresh)..... 1 part.
Lump sugar (powdered)..... 3 parts.

Beat them together in a marble mortar to a smooth paste. Similar conserves are prepared from other fragrant flowers and leaves, particularly those having a sweet or agreeable taste, in which case only twice their weight of sugar is usually employed. They are used to sweeten the breath, but lozenges and pastilles are much more convenient for the purpose.

Lavender Water. See **Waters.**

Lead, to Protect against Corrosion.—Prof. Emerson Reynolds describes a process for the protection of lead against corrosion, which consists in coating it with a film of sulphide of lead. He recommends the following method: Take 16 grm. of solid caustic soda, dissolve it in 1·75 liters of water, and add to the liquid 17 grm. of nitrate of lead, or an equivalent of other lead salt, with 250 cubic centimeters of water; raise the temperature of the mixture to 90° C. If sufficient lead salt has been added the liquid will remain somewhat turbid after heating, and must then be rapidly strained or filtered through asbestos, glass wool, or other suitable material, into a convenient vessel. The filtered liquid is then well mixed with 100 cubic centimeters of hot water, containing in solution 4 grm. of sulpho-urea or thio-carbamide. If the temperature of the mixture be maintained at about 70° C., deposition of sulphide of lead or galena, in the form of a fine adherent film or layer, quickly takes place on any object immersed in or covered with the liquid, provided the object be in a perfectly clean condition and suitable for the purpose.

Lead Pipe, to Protect.—The *Revue Industrielle* says that the interior of a lead pipe can be covered with an incrustation of sulphide of lead by making a warm concentrated solution of sulphide of potash flow through it for ten or fifteen minutes. Pipes thus treated seem to be covered with grayish varnish, which prevents the water flowing through them from acting upon the lead.

Lead, to Prevent from Exploding.—When pouring melted lead around a damp or wet joint, it will often explode or blow out. This may be prevented by putting a piece of resin the size of the end of a man's thumb into the ladle and let it melt before pouring.

Lead Plates, to Join.—The edges are brought together, hammered down into a channel cut out of wood and secured with a few tacks. The hollow is then scraped clean with a scraper, rubbed over with tallow, and a stream of hot lead is poured into it, the surface being afterward smoothed with a hot plumber's iron.

Lead, Sugar of.—Another name for lead acetate. It is very poisonous and is extensively used in dyeing, etc.

Lead Tree.—Ingredients: Sugar of lead, ¼ oz.; zinc fastened to a wire (copper or brass) twisted in the form of a spiral spring. From the center suspend a small porcelain doll with wire twisted around it. Place the lead acetate in a bottle of water, shake well, then thrust zinc and appendages into it and cork securely. In a few days the tree will begin to grow, and produce a most beautiful effect.

Leather. See also **Belting** and **Tanning.**

Leather, Artificial.—1. The leather scraps are first steeped in weak lime water, and then ground fine in ordinary rag-engines as used by paper makers. The leather is then mixed with about half of good manilla rope, colored with Venetian red, and is now ready to be made into either leather board, shoe shanks, heels or stiffenings for heels and toes. The boards are made on an ordinary cylinder board machine, and can be made up to ½ in. thick and more. The shoe shanks are stamped to the proper shape and size on two machines, and then dried. The stiffenings and toes are cut by a machine from the leather board, and then turned and formed to shape and size by another machine, and dried.

2. Leather scrap is shredded, and is then mixed with strong liquid ammonia, which forms a gelatinous mass. It is soluble in water, and has no elasticity until it is mixed with India rubber, dissolved in bisulphide of carbon, and well kneaded, when it is also rendered

waterproof. It is then ready for putting in heel blocks or moulds. Proportion:

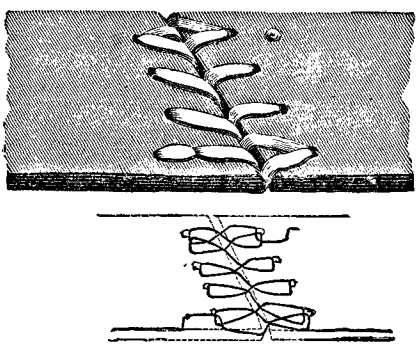
	Rubber.	Ammonia.	Leather.	
For soles	25	67	67	parts.
For heels	25	80	80	parts.

Artificial Leather for Lithographers' Rollers.—Glue, 40 parts; saltpeter, 6 parts; sirup, 40 parts; sugar, 6 parts; water, 10 parts; chrome yellow, 2 parts; oil of almonds, 2 parts. Melt and pour around a core, about ½ in. less in diameter than the mould. Take from the mould when cool, and put for 10 hours in a solution composed of 2 parts sulphate of alumina, 20 parts water, 2 parts potash. Dry in the air four or five days.

Leather, Blacking for. See **Blacking.**

Belts, to Lace. See also **Belting.**

A correspondent in the *Scientific American* says: I send you a sample of belt lacing which I am using in my factory. It is far superior to any other way of lacing. It runs smoother on small pulleys, as it bends to fit them. To lace it, commence in middle or either side. If in



middle divide the string into equal lengths; if on edge, same as sketch, by fastening one end and running across and back. You will readily see its advantages. I suggest it so others may be benefited.

Leather Boards.—A very hard variety of boards is manufactured partly from leather clippings. The leather for this purpose is cut into small pieces like rags, reduced in the engine with about the same quantity of bagging and waste paper, and made into boards on a cylinder in the ordinary manner. The boards acquire the appearance, and to some extent the properties, of leather. The material requires considerable time for washing and grinding, and size is unnecessary in its manufacture.

Leather, Bronzing for. See **Bronzing.**

Leather, Cement for. See **Cements.**

Leather, to Dye. See **Dyeing.**

Leather, Gilding on. See **Gilding.**

Leather, Glue for. See **Glues.**

Leather, to Harden.—Ordinary hemlock tanned sole leather may be said to be hardened without any material alteration of its nature by the following treatment. Prepare a bath as follows:

Slaked lime..... ½ lb.
Sal soda..... 2 lb.
Water ..... ½ gal.

Boil together, cool, and add—

Slaked lime..... ½ lb.
Water..... ½ gal.

Put the leather into this for three days, then remove and put it into a bath of—

Slaked lime..... 3 lb.
Water..... 1½ gal.

and let it soak in this for from two days in summer to three days—or even four days—in winter. When taken out of this, pass through water heated to about 180° F., and then pass between heavily weighted rolls, or if a denser material is demanded, press in a hydraulic press. When subjected to the latter, a product nearly as hard as vulcanite is obtained, but one still possessing the appearance and nature of leather quite distinctly.

Leather, Imitation of (Sören-Sörensons).—Prepared from leather waste and caoutchouc. The leather is first freed from all foreign substances, then by machinery converted into a fibrous, homogeneous material. Then it is treated by ammoniacal liquor. This forms a gelatinous compound which may be pressed in moulds or rolled out in plates. This compound is stiff and hard, but not elastic, and soluble in water. It is mixed with caoutchouc to give it elasticity and make it insoluble in water. The caoutchouc is washed, dried, cut up in small pieces, dissolved in oil of turpentine and mixed with the leather. The mixture is kneaded and then pressed in moulds.

Leather Imitation.—A mixture recommended consists of 16 parts gelatine and 5 parts glycerine. A coloring matter is then added as may be required—caoutchouc to give elasticity, and boiled linseed oil to render the whole sufficiently flexible. This composition is spread upon linen while hot, printed with any pattern desired. The surface is then treated with a solution of alum, sulphate of iron, copper, or zinc. These saline solutions may likewise be mixed with the composition before it is spread on the linen. The surface is lastly varnished, and may be bronzed or gilt. Another composition is obtained by boiling linseed oil with quicklime and borax, which forms a liquid that, on cooling, becomes a thick paste. It is then mixed with rasped cork and more quicklime.

See also *Artificial Leather* above.

Leather, Lacquers for. See **Lacquers.**

Leather (Patent), to Cover the Cracks.—Use the following: Take ½ lb. molasses or sugar, 1 oz. gum arabic, and 2 lb. ivory black; boil them well together, then let the vessel stand until quite cooled; after which bottle off. This is an excellent reviver, and may be used as a blacking in the ordinary way, no brushes for polishing being required.

The first coats of the japan for patent leather are made with linseed oil and Prussian blue, boiled together for some hours; the last coat or varnish, with linseed oil and lampblack, similarly boiled. Each coat is separately dried at a temperature of 160° to 180° F. (71° to 82° C.), and rubbed on the leather by the hand, the skin being nailed on to the surface of a board. As the process is a very delicate one, and requires special knowledge in each part of the operation, it would be useless for any one to attempt to produce japanned leather, except as an experiment, for his own amusement, without serving an apprenticeship to the trade.

Paste for Preserving the Gloss of Patent Leather and to Prevent Cracking.—Melt wax with a little oil of turpentine, olive oil and lard. Mix thoroughly together. When cool it should be a thick paste. Vaseline is excellent. Allow it to remain on one half hour, then dry with Canton flannel.

Leather, to Polish. See **Polishing.**

Leather Preservative.—For leather preservatives that are waterproof:

Beeswax..... 18 parts.
Spermaceti..... 6 parts.
Oil turpentine..... 66 parts.

Asphalt varnish	5 parts.
Borax, powdered	1 part.
Vine twig, black	5 parts.
Prussian blue	2 parts.
Nitro benzol	1 part.

Melt the wax, add powdered borax and stir till a kind of jelly has formed. In another pan melt spermaceti, add the asphalt varnish, previously mixed with oil of turpentine, stir well, and add to the wax. Lastly, add the color, previously rubbed smooth with a little of the mass. Perfume with nitro benzol and pour into boxes. Apply in small quantities, wipe with a cloth, and brush. Use only once a week.

Leather, to Preserve.—1. Equal parts of mutton fat and linseed oil, mixed with $\frac{1}{10}$ their weight of Venice turpentine, and melted together in an earthen pipkin, will produce a dubbing which is very efficacious in preserving leather when exposed to wet or snow, etc. It should be applied when the leather is quite dry and warm. 2. Many other formulæ exist for dubbing, but all contain essentially the same ingredients, 3. A solution of 1 oz. solid paraffine in 1 pt. light naphtha, to which 6 drops sweet oil have been added, is put cold on the soles, until they absorb no more. One dressing will do for the uppers. This process vastly increases the tensile strength of every stitch; and, while not removing the natural moisture of the leather, decidedly waterproofs the boot. A sole lasts two months longer when so treated. 4. There is nothing like castor oil for preserving leather. Applied once a month, or once or twice a week in snowy weather, it not only keeps the leather soft, but makes it waterproof. Copal varnish is the best thing to apply to the soles; but the latter should be thoroughly dry, and if they have been worn, they should be previously roughed on the surface before applying the varnish. Linseed oil is perhaps better than nothing, but it rots the leather; hence the objection to dubbings and other mix ups of mutton suet, linseed oil, etc. The very best thing for waterproofing soles is Szerelmey's freestone liquid; three or four coats of this render the sole perfectly waterproof, and more durable. With regard to castor oil, it may further be said that it does not prevent a polish being produced on the boots, and that leather so treated is avoided by rats, if even its proportion be only $\frac{1}{8}$ to $\frac{2}{3}$ tallow. 5. Long continued observation shows that harness and other leather exposed to the action of ammonia, continually given off in stables, become weak and rotten sooner than ordinary leather. Even when care is taken to protect them with grease this takes place. The addition of a small quantity of glycerine to the oil or fat employed in greasing such kind of leather has been recommended to keep it always pliable and soft.

Leather Bags, to Restore.—Wash over with a strong hot decoction of logwood, and if the color does not please, go over afterward with solution of green copperas.

Leather, Varnish for. See **Varnishes.**

Leaves, *Artificial.*—Usually of the fine glossy silk stuff known as taffeta. The taffeta is dyed of the proper green in the piece before cutting out. It is then stretched out to dry, and afterward further prepared with gum arabic on one side, to represent the glossy upper surface of the leaves, and with starch on the other, to give the velvety appearance of the under side. The latter preparation, colored to suit the exact shade of green to be given to the leaf, must be just of the proper consistence, making the leaf neither too stiff nor too limp, while it gives the proper kind of under surface. Where the leaf requires a marked degree of this velvet texture, it is given by the nap of cloth, reduced to a fine powder and properly tinted. A little gum is lightly passed over the surface, and when partly dry this powder is dusted over the surface, the superfluous portion being shaken off. For giving to the leaf the appearance of nature, by representing the veins and indentations which they always exhibit, various gauffering tools are made use of.

Leaves, to Bleach. See **Bleaching.**

Leaves, to Copy.—Take a piece of thin muslin, and wrap it tightly round a ball of cotton wool as big as an orange. This forms a dabber, and should have something to hold it by. Then squeeze on to the corner of a half sheet of foolscap a little color from a tube of oil paint. Take up a very little color on the dabber, and work it about on the center of the paper for some time, till the dabber is evenly covered with a thin coating. A little oil can be used to dilute or moisten the color if necessary. Then put your leaf down on the paper and dab some color evenly over both sides. Place it then between the pages of a folded sheet of paper (unglazed is best), and rub the paper above it well all over with the finger. Open the sheet, remove the leaf, and you will have an impression of each side of the leaf. Any color may be used. Burnt or raw sienna works the most satisfactorily.—See *Leaves, to Print.*

Leaves, Preserving.—1. They may, after pressing, be dipped in melted beeswax; the same may be applied solid to the surface and be melted with a hot smoothing iron; or they may be varnished with dammar varnish or Canada balsam. Varnishing is objectionable on account of time required for drying.

2. It depends somewhat upon the season when the leaves develop their greatest beauty and variety of tints. Sumac and the leaves of similar plants or trees are usually gathered early in October. Maple, alder, oak, linden, etc., are now at their best. To preserve the leaves they should be thoroughly dried as soon as possible after gathering and trimming. A simple method of drying the leaves expeditiously is the following: Spread the leaves and press in a suitable pan with alternate layers of fine sifted dry sand heated as hot as the hand can bear and set aside to cool. When the sand has cooled the leaves may be removed, smoothed under a hot iron, dipped for a moment in clear French spirit varnish, and allowed to dry in the air.

3. Melted paraffine and wax are sometimes preferred to the varnish.

4. The following is another way: Spread several thicknesses of fine wrapping paper on the ironing table; arrange the leaves of the spray, picking off those which do not add to its beauty, and lay it out smooth. Pass a warm flat iron over a cake of wax and then over the leaves—first on one side and then on the other. Then place the sprays between sheets of bibulous paper, and put under pressure between two flat boards, for several weeks, changing the paper several times.

To Make Skeleton Leaves.—Place the leaves in a little rain water, to which a trace of yeast has been added. Allow the fermentation to proceed until the membranous portion becomes soft and easily washed away in a stream of water. They are bleached by dipping for a few minutes in a strong aqueous solution of sulphurous acid gas, or exposing them (while moist) in a box filled with the vapor of burning sulphur.

3. How to Make Skeleton Leaves and Crystallized Grasses.—These pleasing preparations for household adornment may be made as follows: There is a slow and quick method; the former is by procuring the natural decomposition of the pulpy substance of the leaf by exposure to light in a dish of water; the quick method is by the use of a weak alkaline destructive solution of which soda and lime are the active agents. By the slow method one may proceed as follows: The leaves are laid out smoothly in a pan or dish, and covered with rain water 2 or 3 in. deep, and are held down by means of sheets of glass

resting on small stones at the corners, by which they are prevented from pressing too closely on the leaves They are exposed to the sunlight in a warm window. In two or three weeks they are examined, and all those that have become soft and pulpy are removed to another dish to be cleaned. The rest are left until they, too, become soft. The softened leaves are carefully removed one by one by being floated on to a small sheet of glass; the pulp is pressed out by means of a small stiff painters' brush or a tooth brush, used by tapping up and down, and not by a sweeping motion. This breaks up the pulp only, which is washed away by pouring water upon it from a small pitcher. To make this convenient, the glass may be placed on two wooden bars resting on the edges of a deep dish, with a towel under it to catch the splashings.

4. *The quick method is as follows*: Four oz. sal soda are dissolved in 1 qt. hot water, 2 oz. quicklime are added, and the whole boiled for twenty minutes. The solution is cooled and strained. The leaves are then boiled in this for one hour, or until the pulp is easily removed, when it is washed off as already mentioned. The fibers remain, leaving a perfect skeleton or framework of the leaf. This is bleached by exposure to a solution of 1 tablespoonful of chloride of lime in 1 qt. water, strained clear from sediment. The skeletons are placed in a dish, covered with this solution and kept in a dark closet for two days, watching in the meantime that the fibers are not softened too much and thus injured. After bleaching, the leaves are steeped in clear soft water for a day, and then floated off upon a card and placed between soft napkins until dry. They are then ready to be finally pressed, bent, curled or arranged in bouquets or groups.

Crystallized Grasses.—5. Crystallized grasses and sprays are made as follows: The bunches are first arranged in a suitable manner, tied and secured; a solution of 4 oz. alum to 1 qt. boiling water is made, and when this has cooled to about 90° or blood heat, the bunch of grass and leaves is suspended in it, in a deep jar, from a rod placed across the mouth of it; as the liquid cools crystals of alum are deposited upon every spray, the finer and smaller the weaker the solution is made. This deposit of crystals occurs in the cooling liquid, because hot water dissolves more alum than cold water, and as the water cools the excess of alum forms crystals which attach themselves to any fibrous matter in contact with it more readily than to anything else. These crystals enlarge by accretion constantly, as long as there is an excess of alum in the solution. When the supply is exhausted the solution is warmed and more alum is dissolved in it; it is returned to the jar and the bunch of grasses is replaced. When sufficiently covered with crystals it is taken out and dried and is finished.—*N. Y. Times.*

Leaf Prints, How to Make.—Several years ago I devised a method of taking leaf prints of marked beauty, and a specimen of the work recently sent to Dr. Gray elicited the reply: "It is a new way. Better send account of it to *Botanical Gazette*," etc. I do so, prompted by the belief that the method may be of actual usefulness to the botanist as well as a refining recreation for those who love nature on general principles.

There will be needed for the work: 1. A small ink roller, such as printers use for inking type. 2. A quantity of green printer's ink. 3. A pane of stout window glass (the larger the better), fastened securely to an evenly planed board twice the size of the glass. A small quantity of the ink is put on the glass and spread with a knife, after which it is distributed evenly by going over in all directions with the ink roller. When this has been carefully done, the leaf to be copied is laid on a piece of waste paper and inked by applying the roller once or twice with moderate pressure. This leaves a film of ink on the veins and network of the leaf, and by placing it on a piece of blank paper and applying considerable pressure for a few moments the work is done, and when the leaf is lifted from the paper the impress remains with all its delicate tracery, faithful in color and outline to the original.

To get the best results, however, several points must be carefully noted. Get a ¼ or ½ lb. of dark green ink, which is put up in collapsible tubes, costing from fifty cents to $2 a pound, according to quality. As sold it is invariably too thick for this purpose and should be thinned by adding several drops of balsam copaiba to as much ink as may be taken on a salt spoon.

Much depends on the proper consistency of the ink. In inking the leaf is apt to curl on the roller, but it should part readily from it. In case it sticks tightly the ink is too thick. Take care that the ink is evenly distributed on the glass and roller, as it is essential that each part of the leaf receives an equal coating of ink. If the leaf is large, ink it part by part, keeping the roller supplied frequently. A roller 3 in. long, costing forty cents, will answer for all small leaves and branches of plants. Clean the roller with benzine after using. If the leaf is finely veined the lower surface makes the better print, but if the veins are coarse and large the upper surface may be used. If the specimen is fleshy or brittle, allow it to wilt until it becomes more pliable, or, if necessary, it may be pressed and dried first. In most cases the best copy is obtained after taking one or two impressions, as the leaf takes the ink better after several applications. A good quality of unsized paper that is made slightly damp by putting in a cellar several hours before using is best for general work, but in other cases well sized paper will take a copy that will allow a foliotype (may I coin the word?) to bear inspection side by side with a good lithograph. I find a copying press very valuable in making the impression, especially if the leaf is at all coriaceous. If it be soft it should be covered with a few thicknesses of newspaper. If it is irregular in thickness, paper may be laid over the thin parts, so that equal pressure is received. This is necessary with all leaves that have thick stems. If the leaf or branch is very irregular or delicate or in the absence of a press of any kind, the specimen may be covered with several layers of paper and held in place with one hand while the pressure is applied with the thumb or palm of the other hand as required.

These particulars are as complete as practicable. Experiment will lead to many improvements in details. Employ tact and neatness, and you will be surprised at the result. For illustrating monographs and similar papers where the number is too limited to warrant an expensive lithograph, for identifying a rare specimen, or as an adjunct to an herbarium combining portability, unalterability and beauty withal, the method seems particularly fitted. But aside from this, others may find a delightful and instructive recreation in taking prints of the entire flora of the old farm, the trees of a certain grove, the native annuals of a county, the ferns of a State, or any other special field that seems most inviting. Such copies may be taken in a blank book suited to the purpose, or, better, take them on single sheets of uniform size, as in this way imperfect copies may be thrown out, and when the work is completed they may be named, classified and bound, making a volume of real value and worthy of just pride. I would esteem it a favor as well as a pleasure to hear personally from any one who may employ this method in any way the coming season concerning the progress of their work, with its attendant imperfections and successes.—*Horace M. Engle, in Botanical Gazette.*

Leclanché Batteries. See **Batteries, Leclanché.**

Lemarquand's Alloy. See **Alloys.**

Lemonade.—1. Peel off the yellow rinds from one dozen bright fresh lemons, taking care that none of the rind is detached but the yellow zest—that portion in which the cells are placed containing the essential oil of the fruit. Put these rinds into an earthen vessel, pour over them one pint of boiling water, and set aside in a warm situation to infuse. Express the juice from 2 dozen lemons, strain it into a porcelain bowl, and add 2 lb. of fine white sugar, 3 qt. water and the infusion from the peels. Stir all well together until the sugar is completely dissolved. Now sample, and if required add more acid or more sugar; take care not to have it too watery; make it rich with plenty of fruit juice and sugar.

2. To the juice of 6 lemons and the yellow rind of 2 lemons, and ½ lb. of sugar and 1 qt. of water. Ice the lemonade. Water may be added according to taste afterward.

Artificial Lemonade.—3. Loaf sugar, 2 lb.; tartaric acid, ½ oz.; essence of lemon, 30 drops; essence of almonds, 20 drops. Dissolve the tartaric acid in 2 pt. hot water, add the sugar and lastly the lemon and almond; stir well, cover with a cloth, and leave until cold; put 2 tablespoonfuls into a tumbler, and fill up with cold water. This drink, it is said, will be found much more refeshing and more palatable than either ginger beer or lemonade, and costs only 30 cents for 10 pt. The addition of a very little bicarbonate of potash to each tumblerful just before drinking will give a wholesome effervescing drink.—*Scien ific American.*

4. *Lemonade, Milk.*—Dissolve ¾ lb. loaf sugar in 1 pt. boiling water, and mix with 1 gill lemon juice and 1 gill sherry; then add 3 gills cold milk. Stir the whole well together and then strain it.

5. Take fou lemons, pare the rind as thin as possible; squeeze them into 1 qt. water, add ½ lb. fine sugar; let it stand two or three hours, and pass it through a jelly bag.

6. Another, Effervescing (without a Machine).—Put into each bottle 2 drm. sugar, 2 drops essence of lemon, ½ drm. bicarbonate potash, and water to fill the bottle; then drop in 35 or 40 grn. of citric or tartaric acid in crystals, and cork immediately, placing the bottles in a cool place, or preferably, in iced water.

7. Mr. Bartlett recommends 2 scruples sesquicarbonate of soda, 2 drm. sugar, 4 drops essence of lemon and ½ pt. water; lastly, 8 drm. tartartic acid in crystals. Care must be taken to avoid accidents from the bursting of the bottles.

8. Another form is: Into a soda water bottle nearly filled with water, put 1 oz. sugar, 2 drops essence of lemon (dropped on the sugar), 20 grn. bicarbonate of potash in crystals; and, lastly, 30 to 40 grn. of citric acid, also in crystals. Cork immediately.

9. Lemonade Powder.—Take 1 oz. crystallized citric acid, rub it fine, and mix thoroughly with 1 lb. dry pulverized white sugar, put in a single drop of oil of lemon peel to flavor it and mix well; preserve in bottles for future use. In place of citric acid you may take tartaric acid.

Lemon Beer. See **Beers.**

Lemon Juice, Artificial.—Succus Limonium Factitius.—1. Citric or tartaric acid, 2¼ oz.; gum, ½ oz.; pieces of fresh lemon peel, ¾ oz.; loaf sugar, 2 oz.; boiling water, 1 qt.; macerate with occasional agitation till cold and strain. Excellent.

2. Water, 1 pt.; sugar, 1 oz.; essence of lemon, 30 drops; pure acetic acid to acidulate. Inferior. Both are used to make lemonade.

Length, Measures of. See **Appendix.**

Lenses, to Cement. See **Cements.**

Lenses, Rust on. See **Cleansing.**

Lenses, to Separate.—Place in cold water, heat until the water gets hot and the balsam has melted.

Letters, Porcelain, Cement for. See **Cements.**

Levigation.—The process of reducing substances to fine powder by making them into a paste with water and grinding the mass on a hard, smooth stone or slab, with a conical piece of stone having a flat, smooth under surface, called a muller. Levigation is resorted to in the preparation of paints on a small scale and in the elutriation of powder. The term is also, sometimes, incorrectly applied to the lengthened trituration of a substance in a marble or Wedgwood ware mortar.

Leys.—Ley is an aqueous solution of caustic soda or potassa, by the agency of which the chemical decomposition of the fat and its conversion to soap are effected. Caustic soda is a commercial commodity, but it may happen that the soapmaker will have to prepare his own leys. Reduce the soda or potassa into small pieces, mix it with slaked lime, let it stand twenty-four hours and then leach it out with water. For this purpose large tanks are used, having a perforated floor, placed from 2 to 4 in. above the bottom and covered with a layer of straw, on which is poured the mixture of lime with the alkali. A faucet is inserted between this perforated floor and the bottom, by means of which the liquor can be drawn off. The leys prepared in this way are never perfectly caustic.

Lice, on Cattle.—Take 1 pt. fish oil, pour it on the animal gradually, from the back of the horns to the root of the tail. To cure the cow itch or scratches: Paint the pastern joint well with white lead and oil; any kind of vegetable or animal oil will answer. Keep the cow haltered so she cannot lick her feet or go into water for one week. One application of each remedy is sufficient. On using the oil for lice I have seen a cow in seven days' time shed her coat and in fourteen days' time a new and beautiful coat of hair in its place; took on fat so very fast that in thirty days' time she was ready to kill for beef, and good beef at that. This in all was thirty days from the time she had been served with the dose of oil on her back. She had the prettiest coat of hair I ever saw on an animal's back. We keep our dogs well greased with tanner's oil, to kill fleas and keep off flies in summer time.—*G. B.*

Lice, to Destroy Chicken.—Last summer our hen house was so infested with this vermin that the sitting hens died on their nests. One afternoon I noticed the martins carrying to their box—which was on a pole above the hennery—some green leaves. Watching them I found that they were getting the leaves of the male persimmon. I gathered some of the leaves, threw them into the nests on the hen house floor, and in less than one hour the house was free from the vermin. To boil the leaves and sprinkle with the decoction will be as effective.—*Southern Cultivator.*

Lice, Plant. See **Aphides.**

Lice, on Turkeys.—Put a tablespoonful of sulphur in the nest as soon as hens or turkeys are set. The heat of the fowls causes the fumes of the sulphur to penetrate every part of their bodies, every louse is killed, and, as all nits are hatched within ten days, when the mother leaves the nest with her brood she is perfectly free from nits or lice.

Licorice Lozenges.—Take lump sugar, 100 parts; licorice, 150 parts; powdered starch, 40 parts; mucilage to fix.

Lightning Rods. Code of Rules for the Erection of Lightning Conductors.—The following rules, from the *Report of Lightning Rod Conference, 1882*, published by Messrs. E. & F. N. Spon, have been abstracted under the

directions of Major V. D. Majendie, H. M. Chief Inspector of Explosives, and sent by the Explosives Department of the Home Office to the occupiers of factories, magazines, or stores of explosive materials, and to the police authorities. Reasons based on practical and theoretical evidence are given at length in the report for each rule and recommendation:

1. *Material of Rod.*—Copper, weighing not less than 6 oz. per foot run, the electrical conductivity of which is not less than 90% of that of pure copper, either in the form of rod, tape or rope of stout wires, no individual wire being less than No. 12 B. W. G. (0·109 inch). Iron may be used, but should not weigh less than 2¼ lb. per foot run.

2. *Joints.*—Every joint, besides being well cleaned and screwed, scarfed or riveted, should be thoroughly soldered.

3. *Form of Points.*—The point of the upper terminal of the conductor should not have a sharper angle than 90°. A foot below the extreme point a copper ring should be screwed and soldered on to the upper terminal, in which ring should be fitted three or four sharp copper points, each about 6 in. long. It is desirable that these points should be so platinized, gilded or nickel plated as to resist oxidation.

4. *Number and Height of Upper Terminals.*—The number of conductors or upper terminals required will depend upon the size of the building, the material of which it is constructed, and the comparative height above ground of the several parts. No general rule can be given for this, except that it may be assumed that the space protected by a conductor is, as a rule, a cone, the radius of whose base is equal to the height of the conductor from the ground.

5. *Curvatures.*—The rod should not be bent abruptly round sharp corners. In no case should the length of a curve be more than half as long again as its chord. A hole should be drilled in string courses or other projecting masonry, when possible, to allow the rod to pass freely through it.

6. *Insulators.*—The conductor should not be kept from the building by glass or other insulators, but attached to it by fastenings of the same metal as the conductor itself is composed of.

7. *Fixing.*—Conductors should preferentially be taken down the side of the building which is most exposed to rain. They should be held firmly, but the holdfasts should not be driven in so tightly as to pinch the conductor or prevent contraction and expansion due to changes of temperature.

8. *Other Metal Work.*—All metallic spouts, gutters, iron doors and other masses of metal about the building should be electrically connected with the conductor.

9. *Earth Connection.*—It is most desirable that, whenever possible, the lower extremity of the conductor should be buried in permanently damp soil. Hence proximity to rain water pipes and to drains or other water is desirable. It is a very good plan to bifurcate the conductor close below the surface of the ground, and to adopt two of the following methods for securing the escape of the lightning into the earth: 1. A strip of copper tape may be led from the bottom of the rod to a gas or water main—not merely to a leaden pipe—if such exist near enough and be soldered to it. 2. A tape may be soldered to a sheet of copper, 3 ft. x 3 ft. x ⅛ in. thick, buried in permanently wet earth and surrounded by cinders or coke. 3. Many yards of copper tape may be laid in a trench filled with coke, having not less than 18 square feet of copper exposed.

10. *Protection from Theft, etc.*—In cases where there is any likelihood of the copper being stolen or injured it should be protected by being inclosed in an iron gas pipe reaching ten feet—if there is room—above ground and some distance into the ground.

11. *Painting.*—Iron conductors, galvanized or not, should be painted. It is optional with copper ones.

12. *Inspection.*—When the conductor is finally fixed it should, in all cases, be examined and tested by a qualified person, and this should be done in the case of new buildings after all work on them is finished.

Periodical examination and testing, should opportunities offer, are also very desirable, especially when iron earth connections are employed.

Lightning Rods, to Protect from Rust.—Three parts graphite with 12 parts sulphide of lead and 2 parts of sulphide of zinc. These are then pulverized and 45 parts linseed oil varnish, heated, are added. The lightning rods for metal roofs, etc., that are to be protected from oxidation should then be painted with this.

Lightning Eradicator. See **Cleansing.**

Lights, Colored. See **Pyrotechny.**

Lignine.—(Woody Fiber.)—The fibrous part of wood and of the stalks and leaves of vegetables. It remains when wood has been successively extracted with ether, alcohol, water, dilute acids, and dilute alkalies.

Lima Wood.—A variety of soft red wood, generally considered superior to the ordinary peachwood, though less rich in coloring matter than the Pernambuco variety. In its uses and properties it agrees with Brazil wood.

Lime Wash (Colored).—Add to the lime wash a strong solution of sulphate of magnesia, and color to suit with Vandyke brown.

Lime Water.—To make lime water, agitate an ounce of pure caustic lime in a pint bottle nearly filled with water and after the lime has subsided decant the clear liquid. Keep in well stoppered bottle.

Lime, Vienna.—This is used for polishing. It is prepared from dolomite. The dolomite is burned, slaked and glowed. For use rub the articles with alcohol and apply the lime. Keep the lime in a well stoppered bottle.

Linctus.—A medicine thick as honey, intended to be licked from a spoon.

Linen, to Dye. See **Dyeing.**

Linen, to Wash and Iron. See **Cleansing.** (*Linen* and *Shirts.*)

Liniments and Embrocations.—These are fluid or semi-fluid preparations designed for external use, and may be applied with gentle friction with the hand, or by wetting lint or a cloth with them and laying them upon the part. It is generally well to cover them when thus applied, to prevent evaporation. The term embrocation is applied to some of the more liquid preparations of this class.

Camphorated Liniment of Ammonia:

1. Olive oil ..... 3 fl. oz.
   Camphor (cut small) ..... ½ oz.

Dissolve by a gentle heat, and when cold, add—

   Ammonia (0·960) ..... 1 fl. oz.

as before. Preferred in painful sprains, bruises, chilblains, etc., to the simple liniment.

Another good formula is—

2. Soap liniment ..... 2 fl. oz.
   Olive oil ..... 2 fl. drm.
   Ammonia (0·960) ..... 2 fl. drm.

Mix.

Camphor Liniment:

   Camphor ..... 1 oz.
   Olive oil ..... 4 fl. oz.

Dissolve by a gentle heat. As a friction, stimulant, anodyne and resolvent; in sprains, bruises, chilblains, rheumatic pains, glandular enlargements, etc.

Compound Camphor Liniment:

Camphor	2½ oz.
Oil of lavender (English)	1 fl. drm.
Rectified spirit	17 fl. oz.

Dissolve, then add of—

Ammonia (0·882-0·880)	3 fl. oz.

and shake them until mixed. It is powerfully stimulant, rubefacient and counter irritant. A piece of folded linen wetted with it applied to the part, and then covered with a towel and pressed with the hand, will generally relieve superficial pains. It is commonly sold for Ward's Essence for the Headache.

Soap Liniment—Opodeldoc:

Castile soap (white; cut small)	2½ oz.
Camphor (small)	1¼ oz.
Oil of rosemary (English)	3 fl. drm.
Rectified spirit	18 fl. oz.
Distilled water	2 fl. oz.

Mix, and digest with occasional agitation, at a temperature not exceeding 70° F., until all are dissolved. The above proportions are those of the new Br. Ph. The product is a very beautiful article. That of the shops is usually very weak and inferior, being generally made with crude soft soap and a mixture of equal parts of rectified spirit and water.

Linseed Oil. See **Oils.**

Linseed Meal Poultice.—Linseed meal, 4 oz.; olive oil, ½ fl. oz.; mix, and add, gradually and constanly stirring, of boiling water, ½ pt. This is the formula of the new British Ph. Emollient, soothing and calefacient. Used to promote the suppuration and ripening of tumors, to allay pain, inflammation, irritation, etc.; applied warm. This is the common emollient and suppurative poultice of both private and hospital surgeons.

Lint.—Next to cotton, the vegetable fiber most extensively used for textile fabrics is flax, the Latin name of which is *linum*; hence come the names of linen and lint. The fibers of cotton and flax, viewed under a microscope, will be found to be different; the fiber of cotton is angular, or bladed, while that of flax (linen) is perfectly round and smooth. It is this difference in their natural formation that constitutes the superiority of linen over cotton as a material for dressing wounds, or as a fabric, for clothing the body. Lint is the unwoven fiber of linen. By wear, and much washing, which it necessarily undergoes, linen becomes softer than when new. It undergoes a partial decay, and the much prized linen eventually becomes rag. In this state it is fit only to be converted into paper or lint. Lint is, in fact, the woolly fiber of old linen, thrown or slightly felted together (as manufacturers term it), into the material form so named. The flax plant yields not only linen by means of its fiber, but it also, by expression, gives a valuable oil from its seeds, known in commerce as linseed oil. The residue, after the oil is expressed, is called linseed cake, and is excellent food for cattle. Each product of the flax plant, both in peace and in war, has its value either as linen, linseed, or lint.

Lipowitz's Alloy. See **Alloys** (*Fusible*).

Lip Salves. See **Salves.**

Liquefaction.—Is the conversion of a solid into the liquid state, either by heat (fusion), the absorption of moisture from the air (deliquescence), or by the action of some fluid (solution). Certain gases also may be liquefied by means of cold and pressure.

Liqueurs (*Fr.*) See **Liquors.**

Liquid Glues. See **Glues.**

Liquid Measures. See **Appendix.**

Liquors, Alkaline, to Remove Stains made by.—Try a little ammonia or the juice of a lemon. If the color is destroyed, nothing can be done.

Liquors (Liqueurs) and Cordials.—Many of the following receipts for liqueurs and cordials come from the "Brewer and Distiller." By J. Gardner, F. C. S., but the majority of the receipts were specially translated from the French.

Liquors and cordials are stimulating beverages, formed of weak spirit, aromatized and sweetened. The manufacture of liqueurs constitutes the trade of the compounder, rectifier, or liqueurist.

The materials employed in the preparation of liquors or cordials are rain or distilled water, white sugar, clean flavorless spirit, and flavoring ingredients. To these may be added the substances employed as finings, when artificial clarification is had recourse to.

The utensils and apparatus required in the business are those ordinarily found in the wine and spirit cellar; together with a copper still, furnished with a pewter head and a pewter worm or condenser, when the method by distillation is pursued. A barrel, hogshead, or rum puncheon, sawn in two, or simply unheaded, as the case may demand, forms an excellent vessel for the solution of the sugar; and two or three fluted funnels, with some good white flannel, will occasionally be found useful for filtering the aromatic essences used for flavoring. Great care is taken to insure the whole of the utensils, etc., being perfectly clean, sweet, and well seasoned, in order that they may neither stain nor flavor the substances placed in contact with them.

French liqueurists dististinguish their liqueurs as "eaux" and "extraits," or liqueurs which, though sweetened, are entirely devoid of viscidity; and "baumes," "crêmes," and "huiles," which contain sufficient sugar to impart to them a sirupy consistence; usually "crêmes" contain less alcohol than "huiles."

The French names are retained in the receipts. Where it is not possible to make the liquors by distillation, the receipts which say by essences should be chosen. O. p. means over proof, u. p. means under proof. (See **Alcohol.**) The abbreviations of the metric system should not be forgotten, l. = liter; gr. = gramme; k. = kilogramme. It should be remembered the art of the liquorist can only be obtained by long practice; still with ordinary care very good results can be obtained. Do not get the liquors too aromatic. This is the fault of most amateurs. All liquors should be bottled and labeled with neat labels, and the top sealed with wax or tinfoil.

Absinthe.—1. From the tops of *Absinthium majus*, 4 lb.; tops of *Absinthium minus*, 2 lb.; angelica root, *Calamus aromaticus*, Chinese aniseed, and leaves of dittany of Crete, of each 15 grn.; brandy or spirit at 12 u. p., 4 gal.; macerate for ten days, then add water, 1 gal.; distill 4 gal. by a gentle heat, and dissolve in the distilled spirit crushed white sugar, 2 lb.

2. Spirit of wormwood, 172 parts; best sugar, 125 parts; orange flower water, 13½ parts; water, 125 parts. Dissolve the sugar in the water, and then add the orange flower water; thoroughly mix in the sirup the white of one egg. Next add the wormwood spirit, and heat the mixture very gently over a water bath, so as just to coagulate the albumen; immediately remove the liquid from the fire and filter.

Crême d'Absinthe.—(By Essences.)—Essence absinthe, 0·60 gr.; essence of English mint, 0·60 gr.; essence of anise, 3 gr.; essence of fennel, 0·80 gr.; alcohol, etc., same as Chartreuse.

Absinthe of Montpellier.—Large absinthe (dried), k. 0·250; green anise, k. 0·600; fennel, k. 0·400; coriander, k. 0·100; angelica seed, k. 0·50; alcohol at 85° 9·5 l. Digest the ingredients for twelve hours with alcohol, then add 4·5 l. of water, then distill 9·5 l. of perfumed spirit, Color as follows: dried hyssop (herb and flowers), k. 0·75; dried melisse (balm), k. 0·75; small al-

Lithographic Ink. See **Inks.**

Lithographic Paper. See **Paper.**

Lithographic Stones, to Prepare.—Stones are prepared for chalk drawings by rubbing two together, with a little silver sand and water between them, taking care to sift the sand to prevent any large grains from getting in, by which the surface would be scratched. The upper stone is moved in small circles over the under one till the surface of each is sufficiently even, when they are washed, and common yellow sand substituted for the silver sand, by which means is procured a finer grain. They are then again washed clean, and wiped dry. It will be found that the upper stone is always of a finer grain than the under one. To prepare stones for writing or ink drawings, they are rubbed with brown sand, washed, and powdered pumice stone used instead; the stones are again washed, and each polished separately with a fine piece of pumice stone or water Ayr stone. Chalk can never be used on the stones prepared in this manner. The same process is followed in order to clean a stone that has already been used.

Lithography, Varnishes for. See **Varnishes.**

Lithophanie.—The name given to porcelain biscuit ware. It is much used to make transparencies. The peculiarity of the manufacture consists in having the biscuit of different thicknesses. The thickest parts intercept the light and form the shadows, while the thin forms the high lights.

Litmus Solution.—Digest 1 gramme solid litmus in 50 c.c. of water, filter and apply to unsized paper. Change the color if desired.

Litmus Paper. See **Paper,** *Test.*

Lixiviation.—The process by which the saline matter of such materials as ashes, minerals, etc., is extracted by the aid of water. This solution is called a lye and sometimes a lixivium.

Loam.—Mixture of brick, clay and old foundry sand.

Logwood.—The most important of the dye woods obtained from Hæmatoxylum campechianum, a large tree growing on the coasts of the bays of Honduras and Campeachy, and in some of the Antilles, *e. g.*, Jamaica and St. Domingo. The Campeachy growth is generally preferred.

Lotions. See **Cosmetics.**

Lubricants. See also **Oils.**

General Information on Lubricants.—The general experience gained of various oils used for lubricating tends to the following results: 1. A mineral oil flashing below 300° F., 149° C., is unsafe, on account of causing fire.

2. A mineral oil evaporating more than 5% in ten hours at 140° F., 60° C., is inadmissible, as the evaporation creates a viscous residue, or leaves the bearing dry.

3. The most fluid oil that will remain in its place, fulfilling other conditions, is the best for all light bearings at high speeds.

4. The best oil is that which has the greatest adhesion to metallic surfaces and the least cohesion in its own particles. In this respect fine mineral oils are first, sperm oil second, neatsfoot oil third, lard oil fourth.

5 Consequently the finest mineral oils are best for light bearings and high velocities.

6. The best animal oil to give body to fine mineral oils is sperm oil.

7. Lard and neatsfoot oils may replace sperm oil when greater tenacity is required.

8. The best mineral oil for cylinders is one having sp. gr. 0·893 at 60° F., 15½° C.; evaporating point 550° F., 288° C., and flashing point 680° F., 360° C.

9. The best mineral oil for heavy machinery has sp. gr. 0·880 at 60° F., 15½° C.; evaporating point 443° F., 229° C., and flashing point 518° F., 269° C.

10. The best mineral oil for light bearings and high velocities has sp. gr. 0·871 at 60° F., 15½° C.; evaporating point 424° F., 218° C., and flashing point 505° F., 262° C.

11. Mineral oils alone are not suited for the heaviest machinery, on account of want of body and higher degree of inflammability.

12. Well purified animal oils are applicable to very heavy machinery.

13. Olive oil is foremost among vegetable oils, as it can be purified without the aid of mineral acids.

14. The other vegetable oils admissible, but far inferior, stated in their order of merit, are gingelly, ground nut, colza, and cottonseed oils.

15. No oil is admissible which has been purified by means of mineral acids.

Lubricants for Machinery, etc.—1. Common heavy shop and engine oils are commonly variable mixtures of heavy petroleum or paraffine oils, lard oil, whale or fish, palm and sometimes cottonseed and resin oils. There are nearly as many of these composite oils in the market as there are dealers in such supplies. The following is one of them:

	Per cent.
Petroleum	30
Paraffine oil (crude)	20
Lard oil	20
Palm oil	9
Cottonseed oil	20
	99

Solid or semi-solid unguents, such as mill and axle grease, etc., are prepared from a variety of substances. The following are the compositions and methods of compounding a few of these:

2. Frazer's axle grease is composed of partially saponified rosin oil, that is a rosin soap and rosin oil. In its preparation ½ gal. of No. 1 and 2½ gal. of No. 4 rosin oil are saponified with a solution of ½ lb. of sal soda dissolved in 3 pt. of water and 10 lb. of sifted lime. After standing for six hours or more this is drawn off from the sediment and thoroughly mixed with 1 gal. of No. 1, 3½ gal. of No. 2 and 4⅔ gal. of No. 3 rosin oil. This rosin oil is obtained by the destructive distillation of common rosin, the products ranging from an extremely light to a heavy fluorescent oil or colophonic tar.

3. Pitt's car, mill and axle grease is prepared as follows:

Black oil or petroleum residuum	40 gal.
Animal grease	50 lb.
Rosin (powdered)	60 lb.
Soda lye	2¼ gal.
Salt, dissolved in a little water	5 lb.

All but the lye are mixed together and heated to about 250° Fah. The lye is then gradually stirred in and in about twenty-four hours the compound is ready for use.

4. Hendricks' lubricant is prepared from whale or fish oil, white lead and petroleum. The oil and white lead are, in about equal quantities, stirred and gradually heated to between 350° Fah. and 400° Fah., then mixed with a sufficient quantity of the petroleum to reduce the mixture to the proper gravity.

5. Munger's preparation consists of—

Petroleum	1 gal.
Tallow	4 oz.
Palm oil	4 oz.
Plumbago	6 oz.
Soda	1 oz.

These are mixed and heated to 180° Fah. for an hour or more, cooled, and, after twenty-four hours, well stirred together.

6, 7. A somewhat similar compound is prepared by Johnson as follows:

	Liquid.	Solid.
Petroleum (30° to 37° gravity)	1 gal.	1 gal.
Crude paraffine	1 oz.	2 oz.
Wax (myrtle, Japan and gambier)	1½ oz.	7 oz.
Bicarbonate of soda	1 oz.	1 oz.
Powdered graphite	3 to 5 oz.	8 oz.

8. Maguire uses, for hot neck grease:

Tallow	16 lb.
Fish	60 lb.
Soapstone	12 lb.
Plumbago	9 lb.
Saltpeter	2 lb.

The fish (whole) is steamed, macerated and the jelly pressed throug'. fine sieves for use with the other constituents.

9. Chard's preparation for heavy bearings consist of—

Petroleum (gravity 25°)	12 oz.
Caoutchouc	2 oz.
Sulphur	2 oz.
Plumbago	4 oz.
Beeswax	4 oz.
Sal soda	2 oz.

The composition is stirred and heated to 140° Fah. for half an hour.

10. Booth's.—½ lb. soda, 1 gal. rapeseed oil, 1 gal. water, ½ lb. tallow or palm oil; mix intimately, heat to boiling, and continue stirring till cooled down to 60° or 70° F (15½° to 21° C.).

11. 4 gal. boiling water, ½ lb. Scotch soda, 10 lb. of a mixture of palm oil and tallow in any proportions; treat as 10.

12. 10 lb. Scotch soda, 1 lb. glue dissolved in 10 gal. water, 10 gal. oil, 4 lb. India rubber dissolved in oil of turpentine; add the India rubber last, and stir the whole thoroughly.

13. 2½ lb. lard, 1 oz. camphor, ½ lb. graphite (blacklead). Rub up the camphor into a paste with part of the lard in a mortar, add the graphite and the rest of the lard, and intimately mix.

14. Dissolve 2¼ lb. sugar of lead (lead acetate) in 16 lb. melted but not boiling tallow, and add 3 lb. black antimony, stirring the mixture constantly till cold. For cooling necks of shafts.

15. 4 lb. tallow, 1 lb. graphite, ground together till quite smooth, adding 3 lb. to 5 lb. camphor per cwt.

16. Railway Grease.—For summer use—1¾ cwt. tallow, 1¼ cwt. palm oil.

17. For autumn and spring—1½ cwt. each tallow and palm oil.

18. For Winter.—1¼ cwt. tallow, 1¾ cwt. palm oil. Melt the tallow in an open pan, add the palm oil, and remove the fire the moment the mixture boils; stir frequently while cooling, and when the temperature has fallen to about 100° F. (38° C.), run it through a sieve into a solution of soda (56 to 60 lb.) in 3 gal. water, and stir together thoroughly.

Lubricating Oil, to Clean.—Agitate it with a small percentage of oil of vitriol, and then thoroughly wash it with water by agitation; siphon off the oil, and let stand over quicklime. To filter oil from mechanically contained impurities, fit a small cork, cut star shaped, in the angle of a funnel, so that it will not impede the passage of liquids, and cover this loosely with cotton wool (raw cotton). If properly arranged, the oil will pass through, leaving the impurities in the cotton.

Oil, Lubricating, to Purify.—The following is a good method of purifying lubricating oil: A tub holding 63 qt. has a tap inserted close to the bottom and another about 4 in. higher. In this receptacle are placed 7 qt. boiling water, 3½ oz. carbonate of soda, 3¼ oz. chloride of calcium, and 9 oz. common salt. When all these are in solution, 45 qt. of the oil to be purified are let in and well stirred for five or ten minutes; the whole is then left for a week in a warm place, at the expiration of which time the clear pure oil can be drawn off through the upper tap without disturbing the bottom one.

Oil, Lubricating, to Test.—To test lubricating oil for acid dissolve a crystallized piece of carbonate of soda about as large as a walnut in an equal bulk of water, and place the solution in a flask with some of the oil. If, on settling after thorough agitation, a large quantity of precipitate forms, the oil should be rejected as impure.

Lubricant for Brasswork.—Writing to *Nature* regarding various fats which are used to smooth and bind the surfaces of various kinds of apparatus, such as air pumps, stopcocks, etc., Mr. H. G. Madan says: Melted India rubber answers fairly, but it has too little body and too much glutinosity; moreover, it does, undoubtedly, in course of time, harden into a brittle, resinous substance. Vaseline is quite without action on brass and never hardens, but it has not sufficient tenacity and adhesiveness. A mixture of 2 parts by weight of vaseline (the common thick brown kind) and 1 part of melted India rubber seems to combine the good qualities of both without the drawbacks of either. The India rubber should, of course, be pure (not vulcanized), and should be cut up into shreds and melted at the lowest possible temperature in an iron cup, being constantly pressed down against the hot surface and stirred until a uniform glutinous mass is obtained. Then the proper weight of vaseline should be added, and the whole thoroughly stirred together. This may be left on an air pump plate for, at any rate, a couple of years without perceptible alteration, either in itself or the brass.

Locomotive Grease.

	Summer.	Winter.
	Per cent.	Per cent.
Tallow	18·3	22·3
Palm oil	12·2	12·2
Sperm oil	1·5	1·2
Soda crystals	5·5	5·0
Water	62·5	59·3
	100·0	100·0

Rosin Oil Soap.—One hundred lb. of rosin oil and 80 lb. lime slaked to a powder are agitated in an iron pot and the mixture is heated till a uniform mixture is obtained, free from lumps and running from the stirring implement like sirup. With this rosin oil soap all the different varieties of patent wagon grease are made as follows:

Blue Patent Grease.—Five hundred lb. red rosin oil are heated for one hour with 2 lb. calcium hydrate and allowed to cool. The oil is skimmed off the sediment and 10 or 12 lb. rosin oil soap are stirred in till all is of a buttery consistence and of blue color.

Yellow Patent Grease.—Is prepared by adding 6% of turmeric solution to the blue grease.

Black Patent Grease.—Lampblack is used to produce the black color.

Patent Palm Oil Wagon Grease.—Ten lb. rosin oil soap are melted with 10 lb. of palm oil; 500 lb. rosin oil are then added and as much rosin oil soap to make the whole the consistence of butter, and lastly 7 to 8 lb. of caustic soda lye.

Paraffine Residues.—The thick oil which remains in the paraffine manufacture is used as a lubricating oil, partly on account of its cheapness and partly on account of its not easily solidifying by cold. In order to thicken some lead soap is melted with it.

Mixtures of rosin oil or rosin oil soap and petroleum with glycerine also are often used lubricants.

Anti-Attrition.—Grind together black lead with four times its weight of lard or tallow. Used to lessen friction in machinery and to

prevent iron rusting. Camphor is sometimes added, 7 lb. to the cwt.

Anti-attrition Paste.—Lard, 2½ lb.; camphor, 1 oz.; black lead, ½ lb.; rub the camphor in a mortar down into a paste, with a little of the lard; then add the rest of the lard and the black lead and mix thoroughly.

Anti-friction Grease.—1. Boil together 1¾ cwt. of tallow with 1¼ cwt. of palm oil. When boiling point is reached allow it to cool to blood heat, stirring it meanwhile, then strain through a sieve into a solution of ½ cwt. of soda in 3 gal. of water, mixing it well. The above is for summer. For winter ¼ cwt. of tallow to 1¾ cwt. palm oil; spring and autumn, 1½ cwt. of tallow to 1¼ cwt. palm oil.

2. Anti-friction Grease, Axle Grease, Lubricating Compound.—Melt, but avoid boiling, 16 lb. tallow and dissolve in it 2¼ lb. sugar of lead; then add 3 lb. of black antimony. The mixture must be constantly stirred until cold. This composition is for cooling the necks of shafts and may be of service where the shafts are not of the proper length or the bearings are at fault.

3. Lard, 2½ lb.; camphor, 1 oz.; black lead, ½ lb. Rub the camphor in a mortar into a paste, with a small portion of the lard; then add the remainder of the lard and the blacklead and thoroughly mix.

4. Mankettrick's unvulcanized rubber (dissolved in oil of turpentine), 4 lb.; Scotch soda, 10 lb.; glue, 1 lb.; dissolved in 10 gal. of water; oil, 10 gal., thoroughly incorporated by assiduous stirring, adding the rubber last.

Lubricating Composition for Railway Axles.—In a small boiler dissolve from 56 lb. to 60 lb. of soda in about 3 gal. water. In a 60 gal. boiler melt tallow, and to it add palm oil, each in quantity according to season.

1. In summer weather, tallow, 1 cwt. 3 qr.; palm oil, 1 cwt. 1 qr.

2. In winter, tallow, 1 cwt. 1 qr.; palm oil, 1 cwt. 3 qr.

3. In spring or autumn, tallow, 1 cwt. 2 qr.; palm oil, 1 cwt. 2 qr. As soon as the mixture boils, put out the fire, and let the mixture cool down gradually, frequently stirring it while cooling. When reduced to blood heat, run it off through a sieve into the solution of soda, stirring it well, to insure a perfect mixture of the ingredients.

1. English Railway Axle Grease:

	Summer.	Winter.
Tallow	504 lb.	420 lb.
Palm oil	280 lb.	280 lb.
Sperm oil	22 lb.	35 lb.
Caustic soda	120 lb.	126 lb.
Water	1370 lb.	1524 lb.

2. German Railway Grease:

Tallow	24·60
Palm oil	9·80
Rapeseed oil	1·10
Soda	5·20
Water	59·30

3. Austrian Railway Grease:

	Tallow.	Olive oil.	Old grease.
Winter	10	20	13
Spring and autumn	100	10	10
Summer	100	1	10

4. French Liard.—Dissolve 3 oz. shredded India rubber in 1 gal. finest rapeseed oil by the application of heat.

Axle Grease.—The following is a receipt for a thick oil grease:

1. For use in winter:

Tallow	35 parts.
Oil of resin	10 parts.
Olive or rape oil	65 parts.

2. For use in summer:

Tallow	60 parts.
Oil of resin	8 parts.
Olive or rape oil	40 parts.

The blue color is due to the dark violet tint of the oil referred to, while the yellow tint is produced by the addition of a solution of turmeric root in caustic soda.

Lubricant for Car Axles.—Dark ozocerite, 15 parts; heavy petroleum, 3 to 6 parts. Melt together at a gentle heat. Suitable also for heavy wagons.

Belts, Adhesive Grease for.—To 100 parts of caster oil add 10 parts of tallow. Belts lubricating with this mixture are made flexible, and the friction on the pulleys is increased.

Drill Lubricator.—For drilling wrought iron, use 1½ lb. soft soap, mixed with 1½ gal. boiling water. Insures ease in working and clean cutting.

Liard.—One hundred parts fine rape oil and 2 parts pure unvulcanized rubber, cut fine. Heat over a water bath.

French's Machine Grease:

Petroleum	500 parts.
Graphite	44 parts.
Beeswax	1½ parts.
Tallow	4½ parts.
Caustic soda	1½ parts.

These are mixed together at a boiling heat.

Machinery Lubricants.—1. Graphite, 28 parts; talc, 20 parts; sulphur, 16 parts; wax or paraffine, 16 parts.

2. Graphite, 15 parts; bone glue, 7½ parts; water, 16 parts; sulphur, 6 parts; wax or paraffine, 5½ parts. A patent has been taken out in France for lubricants compounded in this manner.

Metaline.—1. Metaline has been highly commended as a lubricator to prevent the heating of journal boxes in machinery. It appears that it is of very uncertain composition, and some doubts may be expressed as to the truth of all that has been said in reference to it. The first claim is for the following:

2. Eighty parts of finely ground lignum vitæ is ground up with 20 parts of spermaceti, gradually added, and the whole then pressed into a mould.

3. Eighty parts ivory dust and 20 parts spermaceti.

4. Ninety-nine parts tin and 1 part petroleum residue.

5. Ninety-five parts zinc and 5 parts melted India rubber.

6. Ninety parts anthracite and 10 parts oil dry tallow.

7. Ninety-eight parts bronze (composed of 93% copper, 6% tin, 1% lead or zinc) and 2 parts fused rubber.

8. Ninety-six parts type metal and 4 parts fused India rubber.

9. Ninety-five parts oxide tin and 5 parts beeswax.

10. Fifty parts iron, ½ part paraffine and 50 parts tin.

11. Eighty parts lead and 20 parts cannel coal.

12. Ninety-two parts fresh bones and 8 parts beeswax.

13. Ninety parts prepared alumina and 10 parts spermaceti.

14. Ninety-five parts copper glance, free from silica, and 5 parts fused India rubber.

15. Eighty-six parts lead, 12 parts lampblack, 2 parts beeswax.

Oil of Mustard as a Lubricator.—Mix ordinary oil of mustard with a small quantity of petroleum, fish oil or other similar fatty substance. This has been found to be an excellent lubricator for machinery where there is excessive friction, such as turbine wheels, etc.

Watch Oils.—An oil fit to be used as a lubricator for fine mechanism should possess the following essential qualities: It should neither thicken nor dry up nor get hard at a low temperature, nor should it be subject to oxidation. In spite of the vast progress natural science has made of late years, it has not succeeded in discovering an animal or vegetable oil possessing these combined properties without previ-

ous artificial manipulation. Let us mention a few instances:

1. Almond oil has the valuable property not becoming firm till below 17° R., but it oxidizes sooner than any other oil.

2. Poppy seed oil will withstand cold to 15° R. and preserves itself well from oxidation, but it is one of the drying oils and therefore useless as a watch oil.

3. Olive oil, up to the present the most useful among watch oils, does not dry or thicken, nor does it oxidate for a comparatively long time, but it hardens at 2° R.

4. The properties of neatsfoot oil are similar to those of olive oil, but it exceeds the latter in resistance against oxidation.

5. Put 1 oz. pure olive oil in a tumbler, add 2 oz. of 96° alcohol, stirring well; set it away in a dark place for twenty-four hours or more, well covered, then pour into a clean bottle containing 10 oz. distilled or clean rain water; shake violently for five minutes, allow the mixture to stand a half hour or so, then freeze with salt and ice. You will find a good article of fine limpid watch oil, perfectly fluid at top. Draw off with a siphon. Be careful not to break the bottle in freezing.

Lubricating Soap. See **Soaps.**

Lumber, to Preserve.—Lumber treated with steam at a low pressure which has been passed through a vessel containing sulphate of zinc and alum.—*Science Record, 1874.* See also **Wood, Preservation of.**

Luminous Bodies. See also **Paint,** *Luminous*—1. Five parts of a luminous sulphide of an alkaline earth, 10 parts of fluorspar, cryolite or other similar fluoride, 1 part of barium borate; powdered, mixed, made into a cream with water, painted on the glass or stone article, dried and fired in the usual way for enamels. If the article contains an oxide of iron, lead or other metal, it must be first glazed with ground feldspar, silica, lime phosphate or clay, to keep the sulphur of the sulphide from combining with the metal. The result is an enameled luminous article.—*Heaton and Bolas.*

2. Boil for one hour 2¼ oz. caustic lime, recently prepared by calcining clean white shells at a strong red heat, with 1 oz. pure sulphur (floured) and 1 qt. soft water. Set aside in a covered vessel for a few days; then pour off the liquid, collect the clear orange colored crystals which have deposited and let them drain and dry on bibulous paper. Place the dried sulphide in a clean graphite crucible provided with a cover. Heat for half an hour at a temperature just short of redness, then quickly for about fifteen minutes at a white heat. Remove cover, and pack in clay until perfectly cold. A small quantity of pure calcium fluoride is added to the sulphide before heating it. It may be mixed with alcoholic copal varnish. —*Boston Jl. Chem.*

Luminous Paper. See **Paper.**

Luster, Gold, for China Painting.—Dissolve 1 drm. gold in ¾ oz. aqua regia, or simply dissolve this weight of chloride of gold in water. Add 6 grn. metallic tin, and enough aqua regia if required to dissolve it. Pour with constant stirring into a mixture of ½ drm. balsam of sulphur and 20 grn. oil of turpentine. As it stiffens add ½ drm. oil of turpentine and mix. More gold gives a brighter effect; tin inclines it to a violet tinge. Balsam of sulphur is made by boiling together in a covered vessel 1 part flowers of sulphur and 4 parts oil until the mass thickens.—[A correspondent, having tried the above formula, reports that the gold wears off quickly. This is a typical receipt, and was obtained from a reliable authority, but as experiments of this kind are costly, amateurs had better purchase the gold ready prepared. Janvier recommends Lacroix gold (or Lacroix), which can be obtained in several forms.—ED.]

Lusters.—In keramics, the term is used to denote films of metal so thin that they become irridescent.

Lustrine. See **Starch.**

Lutecine. See **Alloys.**

Lutes. See **Cements.**

Lye, to Make Good.—Hickory ashes are the best for making common washing soft soap (when it is not desirable to use the potash lye), but those from sound beech, maple, or almost any kind of hard wood except oak will answer well. A common barrel set upon an inclined platform makes a very good leach; but one made of boards set in a trough in V shape is to be preferred, for the strength of the ashes is better obtained, and it may be taken to pieces when not in use, and laid up. First, in the bottom of the leach put a few sticks; over them spread a piece of carpet or woolen cloth, which is much better than straw; put on a few inches of ashes and from 4 to 8 qt. lime; fill with ashes, moistened, and tamp down well—tamp the firmest in the center. It is difficult to obtain the full strength of ashes in a barrel without removing them after a day's leaching, and mixing them up and replacing. The top should be first thrown off and new ashes added to make up the proper quantity. Use boiling water for second leaching. This lye should be sufficiently strong to float a potato.

Macassar Oil. See **Hair** (*Oils*).

Maceration.—When an infusion is made without the aid of heat, the process is termed maceration. This takes a much longer time than an infusion, rarely requiring less than one, and sometimes several weeks. Those substances to which heat would be injurious or which are easily soluble are treated in this way. In many distillations this method is made use of to soften the substances before putting into the still, and facilitate the extraction of their odorous principle. When tinctures are prepared by maceration, they should be frequently shaken during the process, which should be conducted in glass vessels well stoppered.

Machinery, to Clean. See **Cleansing.**

Madder.—Madder is the root of a plant known as rubia tinctorum, a native apparently of Persia, but which has long been cultivated in Turkey, France and Holland. Several plants of the same and of allied families, contain coloring principles of a similar nature, and are occasionally used in its stead. The Turkey or Levant roots, known also as lizari, are generally imported unground. The pieces are outwardly brown and of a light orange within.

Madeira Wine. See **Wines.**

Mafurra Oil. See **Oil.**

Magenta.—The ordinary trade name given to certain bright bluish red coloring matters, produced by the action of oxidizing agents upon aniline, and found to be compounds of a base known as rosaniline, with certain acids. Thus the variety sold as roseine or acetate of magenta, is an acetate of rosaniline. Fuchsine, fuchsiacine and fuschine are hydrochlorates of the same base, while azaleine and rubine are nitrates. The acetates appear to be the most beautiful.

Magilp.—A mixture of boiled linseed oil and mastic varnish forms a gelatinous substance much used by artists and called magilp.

Magnesia, Citrate of.—1. Magnesium carbonate, 4 oz.; citric acid, 8 oz.; sugar, 12 oz.; water, 9 pt. Flavor with essence of lemon, then dissolve and filter, fill bottles immediately and add to each 30 grn. of potassium hydrogen carbonate and cork securely. Bottles must not be filled any higher than the shoulder. The receipt is sufficient for twelve bottles.

2. Carbonate of magnesia..... 4 oz.
Citric acid..... 8 oz.
Oil of lemon.....25 drops.
Sugar.....14 oz.
Water.....q. s.

Drop the lemon oil on 4 oz. carbonate of magnesia, scrape it and place, together with the citric acid and six parts water, in a wide mouth bottle. In the course of a few hours the solution will be effected. Add the sugar and dissolve by frequent agitation. Filter through paper and divide the clear liquid into twelve suitable bottles. Lastly, these bottles must be nearly filled with filtered water, and to each of them is added, immediately before corking, 40 grn. chemically pure bicarbonate of soda.

Magnets, to Charge. — Correspondents frequently ask the following questions, which are fully answered in their order: 1. For a plain description of how to proceed in order to charge a straight bar of steel with sufficient magnetism to give it the power lifting four times its own weight. Also how to proceed with horse shoe and other forms. 2. The name of the best brand of steel to use—Jessup's, chrome, black diamond, tool or machinery. How to temper. 3. Is there any gain in allowing the bar to remain under the influence of the current for a long time, or does it receive the full charge instantaneously? In fact, we would like some information on this subject that we can rely upon. A. 1. The quickest and best way to magnetize steel bars is to place them centrally in a suitable coil, and then connect the helix with the wires from a dynamo-electric machine or powerful battery for a few seconds, remembering to break the current before removing the magnet from the coil. If the source of the current is a dynamo machine, the coil should be about 2½ in. long and should consist of 10 or 12 layers of No. 12 magnet wire. If a battery is used, a coil 1½ in. long, composed of 14 or 16 layers of No. 16 magnet wire, will be the best. The internal diameter of the coil should be only large enough to admit the bars easily. A battery of six Grenet elements, each having an effective zinc surface of 30 sq. in. connected in series, will do the work very well on small magnets; such, for instance, as are used in telephones. Where a number of magnets are to be made at one time the bars may be passed in a continuous line through the coil, always keeping three bars in contact end to end, adding one above the coil before taking one off below. In this manner sixty bar magnets have been strongly charged in ten minutes. Horse shoe magnets cannot be charged so readily. There are two or three ways of charging them. One way is to place them in contact with the poles of a very strong electro-magnet, removing them after breaking the current; another method is to place each limb of the magnet in a coil adapted to the current to be used, and still another method is to employ a single coil, inserting one pole of the magnet into the coil in one direction, then breaking the current, and inserting the other pole into the coil from the opposite direction. It is well to remember that the magnet will be very much impaired if the current is not broken before removing it from the coil. The secret of success in charging magnets is to have a strong current. It is impossible to make magnets satisfactorily without this all important requisite. 2. As to the quality of steel best adapted to this purpose, machinery steel hardened and not tempered answers admirably. For horse shoe magnets German spring steel is the best. Tool steel answers well if hardened and drawn to a straw color. 3. The steel receives its maximum charge almost instantly. It is useless to allow it to remain under the influence of the magnetizing current more than a few seconds.—*Scientific American.*

Magnesium Powder. See **Photography.**

Mahogany, Filling for. — Take equal parts by weight of whiting, plaster of Paris, pumice stone, and litharge, to which may be added a little French yellow, asphaltum, Vandyke brown and terra di Sienna. Mix with 1 part japan, 2 parts boiled oil and 3 parts turpentine; grind fine in a mill. Lay the filling in with a brush, rub it in well, let it set twenty minutes and then rub it clean.

Maillechort. See **Alloys.**

Malachite, Artificial. — Artificial malachite, which is susceptible to a fine polish, is made by precipitating a solution of sulphate of copper in the cold by carbonate of soda or of potash. The precipitate, which is voluminous, should be allowed first to cohere, and is then dried and washed.

Malleability.—Is the property belonging to certain metals of being beaten out into thin plates, without cracking or breaking.

Malt Extract with Iron. — Distilled water, 4½ parts; phosphate of iron, 3 parts; a little citrate of ammonium. Dissolve and mix with 142½ parts malt extract.

Malt Extract.—Put in a vessel equal parts of crushed malt and water. After standing for three or four hours, add 4 parts warm water. The mixture should be kept for an hour at a temperature of 150° F. Boil up the liquid, press and filter. Evaporate quickly.

Maltha or Greek Mastic.—Mix lime and sand the same as for mortar. Use milk or size, instead of water, to make the proper consistency.

Manganese Alloys. See **Alloys.**

Manifold Paper. See **Paper.**

Manipulations, Chemical and Pharmaceutical.—See the subjects named below: *Cerates, Clarification, Concentration, Decantation, Desiccation, Decoctions, Digestion, Distillation, Dialysis, Elutriation, Emulsions, Evaporation, Extracts, Fusion, Infusion, Liniment, Levigation, Liquefaction, Maceration, Percolation, Pills, Precipitation, Pulverization, Reduction, Saturation, Solution, Sublimation, Suppositories, Tinctures.*

Mannheim Gold. See **Alloys.**

Manures, Artificial.—1. (Anderson.) Ammonium sulphate, common salt and oil of vitriol, each 10 parts; potassium chloride, 15 parts; gypsum and potassium sulphate, each 17 parts; saltpeter, 20 parts; crude Epsom salts, sodium sulphate, 33 parts. For clover.

2. (Huxtable.) Crude potash, 28 lb.; common salt, 1 cwt.; bone dust and gypsum, each 2 cwt.; wood ashes, 15 bushels. For either corn, turnips or grass.

3. (Johnstone.) Sodium sulphate (dry), 11 lb.; wood ashes, 28 lb.; common salt, ¾ cwt.; crude ammonium sulphate, 1 cwt.; bone dust, 7 bushels. As a substitute for guano.

Liquid Manure.—1. Dissolve 25 lb. guano in 5 gallons of water. For use add 2½ oz. of this solution to 5 gal. water.

2. Sheeps' dung, ½ peck, to 15 gal. of water; sulphate of ammonia, ⅝ oz. to every gallon.

Manure from Soot.—Save the soot that falls from the chimneys when the latter are cleaned. Twelve qt. soot to 1 hhd. water makes a good liquid manure, to be applied to the roots of plants. See also **Fertilizers.**

Manuscripts, to Renew.—1. Take a hair pencil and wash the part that has been effaced with a solution of prussiate of potash in water, and the writing will again appear if the paper has not been destroyed.

2. Wash the paper with a strong solution of tannin. Dry carefully.

To Preserve.—Mix 100 pt. collodion with 2 pt. stearine. Give the paper a coating of this. It dries in twenty minutes.

Maple Beer. See **Beers.**

Maps.—*Backing Maps with Muslin.*—Stretch your muslin (ordinary cotton stuff) on a wooden stretcher by means of tacks, cover your map on the back with an even and thin coat of good boiled starch or flour paste or other sticking materials, no matter what, if it only sticks. Lay the map on the cloth, only taking care to do this smoothly and to avoid wrinkles; rub it evenly down after temporarily covering the place you rub with a piece of clean paper so as to avoid friction over the map itself. Let it dry, and the work is done. In order to avoid wrinkles, it is quite essential to let your paper map, after being covered with the starch paste, soak for a few minutes, so as to give the paper a chance to expand from the moisture. It will then, while contracting from the drying, obtain a very smoothly stretched surface. Bookbinders always carefully observe this when pasting papers on book covers, etc.

Map Colors.—1. Blue.—A weak mixture of sulphate of indigo and water, to which add a small quantity of gum.

2. Green.—Dissolve crystals of verdigris in water, and add a small quantity of gum.

3. Red.— Make a decoction of Brazil dust in vinegar and a small quantity of gum and alum; or make an infusion of cochineal and add a little gum.

4. Yellow.—Dissolve gamboge in water, or make a decoction of French berries, strain, and add a small quantity of gum arabic.

To Mount Maps.—1. Stretch smooth factory cloth upon a frame and coat it with glue size. Before this dries, apply a strong flour paste to the back of the map, and lay it smoothly on the cloth. Let it remain until perfectly dry. If the map is to be varnished, apply two or three coats of isinglass size, and after it becomes thoroughly dry, flow on a coat of varnish consisting of balsam of fir diluted to the proper consistency with turpentine.

2. Stretch the muslin on a flat table, tacking the edges if necessary, spread the paper face downward on another table, and rub it over with perfectly smooth flour paste. If necessary, the paste must be passed through a fine wire sieve. If properly made, this will not be required. Then lift the paper and place it paste side downward on the muslin. Lay another piece over it, and rub it down with the hand.

Relief Maps.—Suppose you have a map of a section of country on which are marked contour lines made by passing horizontal planes at vertical distances of 10 ft., or any other distance. Take sheets of cardboard so that the thickness shall represent 1 ft., then 10 superposed will give 10 ft. The thickness of the cardboard is of course the unit of your scale, both vertical and horizontal. Now cut out pieces of cardboard of the same size and shape as the horizontal space embraced by the different contour lines. Then on your map draw in between the contour lines and approximately parallel to the nine other lines, and cut pieces of cardboard corresponding to them. Superpose these in their regular order, and you have the rough formation in relief of your map. The pieces of cardboard are pasted together and carefully pressed to keep the whole mass uniform. Then smear wax over the whole, in order to make a smooth surface. Different colors will represent roads, grass, rivers, etc. Trees or forests can be represented by dried green moss. Houses and other buildings and constructions are made of wax. In the practical work of making such a map, other details may come up, but they will generally be such as will present little difficulty to any one at all conversant with modeling. The chief difficulty lies in procuring maps with contour lines marked on them.

Maps, Varnish for. See **Varnishes.**

Maraschino. See **Liquors.**

Marble, Artificial.—1. Reduce marble dust or white limestone to a very fine powder by grinding and sifting, mix with it intimately about ¼ its weight of zinc oxide (zinc white) and ⅛ its weight of Portland cement, and mix thoroughly into a thick paste with a sufficient quantity of a hot aqueous solution of waterglass, containing about 40% of the glass. Mould the paste under pressure while warm, and expose the moulded form for a week or ten days to warm dry air, before finishing.

2. A solution of alum is made by dissolving the alum in sufficient water, and then plaster of Paris is put right into the vessel containing the liquid. It is then so mixed that the solution reaches all portions of the plaster. Next, as described, it is baked.

3. Good Portland cement and colors that take on that material are mixed dry and made into a paste with the least quantity of water added. One paste has to be made for each color. The different pastes are placed on top of one another in layers of different thickness. The mass is pressed from all sides and beaten so that the colors of the different parts impress themselves on each other without uniformity. The result is that more or less deep veins penetrate the mass; this is then sawed into plates, which are pressed in a mould for twelve days, during which time it is necessary to keep them moist as long as they are not entirely hardened. The plates are polished in the same way as marble.

4. H. Bruck says this composition (marmorit) contains 2 parts of magnesia, 2 parts of lime and quicklime, 1 part of carbonic acid, ¼ part of silicic acid, ¼ part of argillaceous earth, and 1 part of magnesium chloride.

Marble, Cements for. See **Cements.**

Marble, to Clean. To clean marble from discoloration: Try 2 parts sodium carbonate, 1 part of pumice stone, and 1 part of finely powdered chalk. Mix into a fine paste with water. Rub this over the marble, and the stains will be removed; then wash with soap and water. See also **Cleansing** (*Marble*).

Marble, to Gild. See **Gilding.**

Marbling. See **Graining.**

Marbleizing Mantels.—The slate is coated with asphalt, ground to a smooth surface, and baked. The paints are mixed in oil and floated on water, the prepared slate being brought into contact with the under surface of the paint by bringing it up through the water. The paint thus adheres in irregular patches, producing the marbleization. After drying it is again baked.

Marble, to Polish. See **Polishing.**

Marble, to Stain. See **Dyeing.**

Marine Glue. See **Glues.**

Marking Ink. See **Inks.**

Marking Tools.—To mark tools warm them slightly, and rub the steel with wax, or hard tallow, until a film gathers. Then scratch the letters on the wax, cutting through to the steel. A little nitric acid poured on the writing will quickly eat out the letters. Wash off the acid and remove the wax with a hot rag, and the letters will be securely etched. See **Etching.**

Marley's Alloy. See **Alloys.**

Marly.—The flat border of a plate.

Martial Regulus. See **Alloys.**

Masks, Life. See **Plaster Casting from Life.**

Masses, for Flowers, etc. See **Compositions.**

Masses for Picture Frames, etc. See **Compositions.**

Massicot. See **Litharge.**

Mastic.—Mastich, Gum Mastic.—The resin flowing from the incised bark of *Pistacia lentiscus*, var. Chia. It occurs in pale yellowish,

transparent, rounded tears, which soften between the teeth when chewed, and give out a bitter, aromatic taste, sp. gr. 1·07. It is soluble in both rectified spirit and oil of turpentine, forming varnishes. It is chiefly used as a masticatory to strengthen and preserve the teeth and perfume the breath.

Matches.—For complete information consult *Dussauce, Practical Treatise on the Fabrication of Matches, etc.*

Matches.—Ordinary matches are small slips of wood which have been dipped in sulphur, and afterward tipped with a paste capable of ignition by friction. This paste contains:

1. Common phosphorus, 4 parts; niter, 16 parts; red lead, 3 parts; strong lead, 6 parts.

2. Ordinary phosphorus, 9 parts; niter, 14 parts; binoxide of manganese, 14 parts; gum or glue, 16 parts. Melt the glue at 212° F., gradually add the phosphorus, which must be well stirred into the liquid; then add the niter and coloring matter. Keep the paste at a regular temperature of about 97° F. by means of hot water under the marble or cast iron slab on which it is spread while the matches are being dipped. If gum is used, all the operations may be more easily performed, as the materials can be mixed cold; but the matches made with gum are easily spoiled by damp.

Chlorate Matches.—Prep. Chlorate of potassa, 30 grn.; flowers of sulphur, 10 grn.; powdered lump sugar, 8 grn.; powdered gum arabic, 5 grn.; vermilion, enough to color. *Proc.* Reduce the chlorate to fine powder in a marble or Wedgwood ware mortar, then place it on a stone slab, add the other ingredients, and mix them all together with a wooden or bone knife, adding just sufficient water to make a paste. Into this mixture the points of matches, made of slips of thin wood or pasteboard, are to be dipped, and afterward carefully dried in a moderately warm situation.

English Matches.—Two parts fine glue soaked in water till quite soft, 4 parts water, heated together in a water bath till quite fluid; remove the vessel from the bath, and add 1½ to 2 parts phosphorus, agitating the mixture briskly and continually with a stirrer having wooden pegs or bristles projecting beneath. When the mass is uniform, 4 or 5 parts chlorate of potash, 3 or 4 parts powdered glass, and sufficient coloring matter in the form of red lead, smalts, etc., are cautiously added, and the whole is stirred till cool.

Friction:

Fine glue	2 parts.
Water	4 parts.
Phosphorus	1½ to 2 parts.
Potassium chlorate	4 to 5 parts.
Powdered glass	3 to 4 parts.

Red or white lead or smalt sufficient to color.

Parlor

Dry the splints and immerse the ends in melted stearine. Then dip in following mixture and dry:

Phosphorus (red)	3 parts.
Gum arabic or tragacanth	0·5 part.
Water	3 parts.
Sand (finely ground)	2 parts.
Binoxide of lead	2 parts.

Perfume by dipping in a solution of benzoic acid.

Matches without Phosphorus.—1. For the production of these lucifers a mixture of from 4 to 6 parts of chlorate of potash and 2 parts each of bichromate of potash and of oxide of iron or lead, with 3 parts strong glue is used. For the igniting surface, a mixture of 29 parts sulphate of antimony, 2 to 4 parts bichromate of potash, 4 to 6 parts oxide of either iron, lead or manganese, 2 parts of glass powder and from 2 to 3 parts strong glue or gum. These matches will ignite only on the friction surface thus prepared.

2. For the match heads a mixture of chlorate of potash and a compound of hyposulphurous acid with soda, ammonia and oxide and suboxide of copper. This compound is formed by dividing a solution of copper into two equal parts, supersaturating one of them with ammonia and the other with hyposulphate of soda; then mixing the two solutions and stirring the mixture well, a violet powder precipitates. One part of it is to be mixed with 2 parts of the chlorate of potash, and a small quantity of pounded glass. Lucifers made in this way are, however, objectionable, from the fact that they will ignite on any rough substance, even more easily than the common kind.

3. The following is one of the best receipts for composition match tips without phosphorus. It is the same as that used in preparing the well known U. and P. matches and does not require a separate rubber or prepared surface:

Potassium chlorate	26 oz.
Manganese, black oxide	25 oz.
Potassium bichromate	20 oz.
Lead cyanide	20 oz.
Antimony oxysulphide	20 oz.
Glass powder	4 oz.

These substances are first powdered separately and then gradually mixed into a solution of 1 lb. gum in 4 lb. water, to form a thick, smooth paste; with this paste the dry wood splinters are tipped, and after about eighteen hours' exposure to the air in a drying room, kept at about 80° Fah., the matches are ready for boxing. To render the matches non absorbent of moisture or waterproof, they are momentarily dipped into a liquid composed of

Shellac, best white	1 lb.
Alcohol, or wood naphtha	1 qt.

digested together in a closed vessel for several days with occasional agitation, then strained through fine linen cloth.

Safety Matches.—1. Dip the splints in a paste composed of chlorate of potash, 6 parts; sulphide of antimony, 2 to 3 parts; glue, weighed dry, 1 part. The paste for the rubbing surface is amorphous phosphorus, 10 parts; oxide of manganese, or sulphide of antimony, 8 parts; glue, 3 to 6 parts, weighed dry. The ingredients must be thoroughly mixed, and care must be taken not to mix the chlorate of potash in the dry state with the other materials; it should be mixed first with glue dissolved in warm water. The paste for the rubbing surface may be spread with a brush or spatula on the side of the box.

2. Glue, 16 parts; chrome yellow, 2 parts; oxide of iron, 2 parts; peroxide of manganese, 24 parts; hyposulphite of lead, 8 parts; and chlorate of potash, 36 parts. Composition for the box.—Hyposulphite of lead, 260 parts; chlorate of potash, 14 parts; oxide of iron, 7 parts; powdered glass, 8 parts; finest glue, 4 parts; and amorphous phosphorus, 24 parts. Glue is dissolved in water; other ingredients being in powder, are afterward mixed with it to the consistence of paint and applied with a brush to the surface of the box.

Silent Matches.—1. Dissolve 16 parts gum arabic in least possible quantity of water, triturate in 9 parts powdered phosphorus and add 14 parts niter, 16 parts vermilion or binoxide of manganese, and form the whole into a paste.

2. Six parts glue soaked in a little cold water for twenty-four hours, and liquified by trituration in a heated mortar; add 4 parts phosphorus and rub down at a heat not exceeding 150° F. (66° C.); mix in 10 parts powdered niter and then 5 parts red ocher and 2 parts smalts and form the whole into a uniform paste.

3. Instead of phosphorus, lead sulphocyanate mixed with precipitated antimony sulphide is treated in the moist state with an oxygenous substance, such as potassium chlorate, with indifferent coloring and rubbing agents, such as

glass, quartz, pumice powder, ultramarine, etc., and with glutinous substances, such as glue, gum and dextrine. The mixture is used in place of the materials employed for igniting sulphur matches, wax lights, etc.—*H. Schwarz.*

4. The following is the recipe given by Berzelius: Weigh out 30 parts powdered chlorate of potash, 10 parts of powdered sulphur, 8 parts of sugar and 5 parts of gum arabic, with a little cinnabar to communicate color. The sugar, gum and salt are first rubbed together into a thin paste with water. The sulphur is then added and the whole been thoroughly beaten together, small brimstone matches are dipped in, so as to retain a thin coat of the mixture upon their sulphured ends. When quite dry they are fit for use.

Swedish.—1. Matches from Sweden were found to be tipped with an igniting composition made up of the following substances:

	In 100 parts.
Glass	8·77
Glue	7·12
Potassic bichromate	5·59
Potassic chlorate	46·76
Ferric oxide	4·09
Manganese	13·07
Sulphur	7·41

It is supposed that the following proportions were employed in the manufacture of the composition:

Glass	1¼ lb.
Glue	1 lb.
Potassic bichromate	¼ lb.
Potassic chlorate	6¾ lb.
Ferric oxide	½ lb.
Manganese	2 lb.
Sulphur	1 lb.

In consequence of the small proportion of oxygen yielding substances to sulphur, a large quantity of sulphurous acid is evolved on igniting the mass.

2. In another composition, likewise from Sweden, Wiederhold found to 1 of sulphur 21 of potassic chlorate. This composition yielded no free sulphurous acid, the sulphur being wholly oxidized to sulphuric acid.—*Dingler's Polyt. Journ.*

Matches without Sulphur.—Char the ends of the splints with red hot iron, dip them into a thin layer of stearic acid or wax, melted in a flat-bottomed tinned copper pan. The dipping paste for these matches is ordinary phosphorus, 3 parts; strong glue, 3·5 parts; water, 3 parts: fine sand, 2·0 parts; coloring matter, 0·1 to 0·5 parts; chlorate of potash, 3 parts. These matches burn readily, with a bright flame, and have no unpleasant smell. Amorphous phosphorus not being poisonous or liable to accidental ignition, is preferable to ordinary phosphorus. The paste used is amorphous phosphorus, 3 parts; chlorate of potash, 4 parts; glue, 2·5 parts; water, 5 parts; pounded glass, 2 parts.

Vestas.—Vestas are tipped with similar ingredients, but the taper being less rigid than wood, a larger proportion of phosphorus is added.

Vesuvians.—The heads of vesuvians are made up principally with powdered charcoal and saltpeter in some such proportions as the following: Eighteen parts saltpeter, 19 parts charcoal, 7 parts powdered glass, 5 or 6 parts gum arabic; to these ingredients are added a little scent in the form of satinwood, lignum-vitæ dust, cascarilla bark or gum benzoin, which renders them fragrant while burning. The igniting composition is identical with safety matches.

Matrices, Paper.—Paper matrices for making stereotype plates from type forms, used in newspaper offices, are prepared as follows: Make a jelly paste of flour, starch and whiting. Dampen a sheet of soft blotting paper, cover its surface with the paste, lay thereon a sheet of fine tissue paper, cover the surface with paste, and so on until four to six sheets of the tissue paper have been laid on. The combined sheet thus made is then placed, tissue face down, upon the form of types, which are previously dusted with whiting, and with a brush driven down upon the types and thereon allowed to dry. The operation of drying is facilitated by having the types warmed by placing them upon a steam heated table. A blanket is placed over the paper during the drying operation. There is a better process in which a special kind of tissue paper is used.

Matrices, Paste for. See **Pastes.**

Mats.—To Prepare Sheepskins for Mats.—1. Make a strong lather with hot water and let it stand till cold; wash the skin in it, carefully squeezing out all the dirt from the wool; wash it in cold water till all the soap is taken out. Dissolve 1 lb. each of salt and alum in 2 gal. of hot water, and put the skin into a tub sufficient to cover it; let it soak for twelve hours, and hang it over a pole to drain. When well drained stretch it carefully on a board to dry, and stretch several times while drying. Before it is quite dry, sprinkle on the flesh side 1 oz. each of finely pulverized alum and saltpeter, rubbing it in well. Try if the wool be firm on the skin; if not, let it remain a day or two, then rub again with alum; fold the flesh sides together and hang in the shade for two or three days, turning them over each day till quite dry. Scrape the flesh side with a blunt knife and rub it with pumice or rotten stone.

2. Fur skins are tanned by first removing all the useless parts and softening the skin by soaking, then remove the fatty matter from the inside and soak it in warm water for an hour. Next mix equal parts of borax, saltpeter, and sulphate of soda in the proportion of about ½ oz. of each for each skin, with sufficient water to make a thin paste; spread this with a brush over the inside of the skin, applying more on the thicker parts than on the thinner; double the skin together, flesh side inward, and place it in a cool place. After standing twenty-four hours wash the skin clean, and apply in the same manner as before a mixture of 1 oz. sal soda, ½ oz. borax, and 2 oz. hard white soap, melted slowly together without being allowed to boil; fold together and put away in a warm place for twenty-four hours. After this, dissolve 4 oz. alum, 8 oz. salt, and 2 oz. saleratus in sufficient hot rain water to saturate the skin; when cool enough not to scald the hands, soak the skin in it for twelve hours; then wring out and hang it up to dry. When dry repeat the soaking and drying two or three times till the skin is sufficiently soft. Lastly, smooth the inside with fine sandpaper and pumice stone.

3. Another description of the process. Wash while fresh, in strong soapsuds, first picking from the wool all the dirt that will come out. A little paraffine, a tablespoonful to 3 gal. of water, will aid in removing the impurities. Continue to wash the skin in fresh suds till it is white and clean. Then dissolve ½ lb. each of salt and alum in 3 pt. of boiling water, put into it water enough to cover the skin, which should soak in the solution twelve hours, and then be hung on a line to drain. When nearly dry nail it, wool side in, on a board, or the side of a barn, to dry. Rub into the skin an ounce each of pulverized alum and saltpeter, and if the skin is large double the quantity. Rub for an hour or two. Fold the skin sides together, and hang the skin away for three days, rubbing it every day or till perfectly dry. Then with a blunt knife clear the skin of impurities, rub it with pumice or rotten stone, trim it into shape, and you have a door mat that will last a lifetime. If it is to be dyed, have a shallow vessel as large as the skin in which to prepare the dye, so that the skin can be laid wool side down smoothly into the vessel, that all parts may be equally immersed in the dye. This should not

be more than an inch deep, otherwise the skin might be injured by the hot dye. After coloring again stretch the skin to dry, and then comb with a wool or cotton card.—*English Mechanic.* See also **Tanning.**

Matt. See **Regulus.**

Matting, to Clean. See **Cleansing.**

Mayonnaise:

Powdered turmeric	1	oz.
Powdered tragacanth	1	oz.
Olive oil	8	oz.
Eggs	8	oz.
Water	5¾	pt.
Ground mustard	1½	oz.
Salt	8	oz.
Acetic acid (glacial)	2	oz.
Tincture of capsicum (Or according to taste.)	½	oz.
Sugar	1	lb.

Mix the first three ingredients in a mortar capable of holding one gallon, then add the eggs, which have been whipped previously, and incorporate thoroughly until an emulsion is formed; next mix separately the mustard and water, allow to stand ten or fifteen minutes, or until the flavor is fully developed, then add the last four ingredients, mix and add the liquid gradually to the contents of the mortar. It should make a smooth, uniform emulsion; finally, strain through cheese cloth.

This is a seasonable preparation, and may serve not only for the delectation of the pharmacist himself, but would furnish an article of sale as well.—*Pharm. Era.*

Mead.—Mead is an old fashioned beverage, but a very pleasant one, if care is taken in making it. It is generally made over strong, too much honey being used to the proportion of water. The following is a good recipe:

1. On 30 lb. honey (clarified) pour 13 gal. soft water, boiling hot. Clarify with the whites of eggs, well beaten; boil again, remove all scum as it rises, add 1 oz. of best hops, and boil for ten minutes, then pour the liquor into a tub to cool, spreading a slice of toast on both sides with yeast, and putting it into the tub when the liquor is nearly cold. The tub should stand in a warm room. When fermentation has thoroughly begun, pour the mixture into a cask, and as it works off, fill up the cask, keeping back some of the liquor for this purpose. Bung down closely when fermentation has ceased, leaving a peg hole, which can be closed up in a few days. Let it remain a year in the cask before bottling off.

2. To 15 lb. honey add 6 gal. of water; clarify the honey with white of eggs; boil for ten minutes, and keep thoroughly skimmed; add a handful of mixed herbs, thyme, rosemary tops and bay leaves; boil for half an hour more; strain the mixture into a tub upon 5 pt. ground malt; stir well together, and, when lukewarm, strain through a cloth into another tub; work it with yeast, and when fermentation is set up, pour it into a cask. Suspend in the cask a muslin bag containing sliced ginger, ½ oz.; ¼ oz. each of cloves, nutmeg and mace, well bruised; bung up tightly when it has ceased working, letting the bag of spices remain. It should stand in the wood for a year and then be bottled off.

Sack Mead.—To every gallon of water allow 4 lb. honey; boil for three-quarters of an hour, skimming well; to each gallon of liquor add ½ oz. hops; boil again for a quarter of an hour; pour it into a tub and let stand for twenty-four hours, working with yeast; then pour into the cask, and to 13 gal. of liquor allow 1 qt. sack. Close lightly until all fermentation has ceased, then bung up close. If a large cask, allow a year in wood before bottling off.

American mead is made with cider. Take 20 lb. honey and 12 gal. good cider, and blend them together in a tub; ferment with yeast, then pour into a cask and add ½ gal. rum, ½ gal. French brandy, 4 oz. red tartar, dissolved, and ½ oz. cloves. Bung down close when it has ceased working and bottle off at the end of three months; it will be fit for use three months afterward.

Measures, Etc. See **Appendix.**

Meat, Preservation of. See also **Antiseptics.**

Meat, to Preserve.—Dr. Richardson says that putrefactive changes in meat are due to the decomposition of the water contained in the tissues. The means which have been found to arrest this decomposition are, first, a low temperature; second, a high state of desiccation; third, the application of antiseptics; fourth, the exclusion of air.

Refrigeration.—Subjection to a low temperature is a thoroughly effective way of preserving meat, but it can be considered only as temporary, decomposition ensuing when the cold state is abandoned. Nevertheless, its effects are sufficiently lasting to serve practical ends, and the process seems most likely to solve the problem of conveying large quantities of fresh meat to foreign countries. Numerous plans have been devised, all aiming at the production of a sufficiently low temperature at a remunerative cost. The principal are:

1. Harrison's.—The meat is first frozen and is then packed in a chamber on board ship, the air of which is maintained in a thoroughly dry state, so as to keep up a slow but constant evaporation from the surface of the meat. The meat is placed in tanks, which are kept cool by directing a stream of brine among ice, and regulating the strength of the brine so as to produce the desired degree of cold. The ice and brine are kept in tanks above the meat, and from them streams constantly trickle over and around the meat tanks. The consumption of ice is less than 50 tons for 50 tons of meat, and the proportion decreases with larger quantities. The meat retains its full flavor and will keep good in a temperature of 63° to 68° F. (17° to 20° C.) for seventy or eighty hours after removal from the tanks. The drawback is the bulk of ice required.

2. Tellier's.—The joints of meat are placed in a chamber; through which is passed a current of air charged with ether or other volatile substance, so as to reduce the temperature sufficiently low to preserve the meat without freezing its juices.

3. Mort and Nicolle's.—In this process the freezing agent is ammonia solution under a pressure of 50 to 70 lb. a square inch. The freezing room is kept below 32° F. (0° C.) and the meat is frozen quite hard.

4. Poggiale's.—A low temperature is maintained by the evaporation of methylic ether and circulation of chloride of calcium.

5. Professor F. Sacc's (Neufchatel, Switzerland) process for curing meat by submitting it to the action of acetate of soda is very simple. Arrange the meat in a barrel, deposit about and on it powdered acetate of soda to about the quarter of the weight of the meat. In summer the action takes place immediately; in winter it is necessary to place the vessels in a room warmed to about 68° F. The salt absorbs the water of the meat; after twenty-four hours the pieces are turned and the lower placed uppermost. In forty-eight hours the action is finished and the pieces are packed in barrels with their brine, or dry in the air. If the barrels are not full, it suffices to fill up with the brine made by dissolving 1 part (by weight) of the acetate of soda in 3 parts of water. The pieces may be of ordinary size, and when required for use may be freed from the salt by washing in running water. The dry acetate of soda may be recovered from the brine by evaporating off the water over a fire.

6. According to Mr. E. Polenske, the composition of some of the preparations employed in commerce for the preservation of meat is as follows: Sozolithe:

Sulphite of ammonia	37·3%
Sulphurous acid	39·7%
Soda	21 %
Water	2 %

7. Concentrated berlinite:

Crystallized borax	82·7%
Boric acid	9·8%
Chloride of sodium	7·5%

8. Poechel berlinite:

Chloride of sodium	45·9%
Nitrate of potash	32·3%
Boric acid	19·3%
Water	2·5%

9. The Minerva Chinese preservative powder:

Chloride of sodium	25 %
Boric acid	17·7%
Sulphate of soda	38·8%
Sulphite of soda	9·2%
Water	9·3%

10. Australian salt:

Crystallized borax	94 %
Chloride of sodium	5·5%

With 0·5% of some hydrocarburet.

11. Ruger's barmenite:

Boric acid	50%
Chloride of sodium	50%

12. The True Australian Meat Preservative.—According to analyses of three specimens from different sources, this is bisulphite of lime. This is what is unwittingly employed in solutions by butchers, on summer afternoons, for painting their meat. It is sold to them under various fantastic names. The liquid is nothing but a solution of lime in sulphurous acid, and is used every day in brewing as a disinfecting agent. The bisulphite of lime, applied to meat, preserves it from the attack of flies and keeps it looking well. There is no danger attending the use of it, since a portion of the sulphurous acid volatilizes, and the sulphite changes into sulphate of lime or plaster, which, as well known, is innocuous. A simple washing, moreover, suffices to remove the sulphite completely at the moment of preparing the meat. This preservative agent is particularly valuable during the heat of summer, and the use of it can be very safely recommended. In commerce, it is found in a more or less concentrated solution containing:

	No. 1.	No. 2.
Sulphite of lime	36·73%	11·04%
Sulphurous acid	20·46%	30·04%

—*Chronique Industrielle.*

Medicinal Soaps. See **Soaps.**

Medium.—Anything in which pigments are mixed, such as oil, turpentine, etc.

Meen Fun. See **Powders.**

Meerschaum.—This mineral is a hydrous silicate of magnesia; it occurs in veins and nodules. It comes chiefly from Asia Minor. Its composition is silica, 60 parts; magnesia 28 parts; water, 12 parts. Its principal use, for making the bowls of pipes.

Meerschaum, Artificial.—Hardened gypsum, boiled with stearic acid or paraffine, much resembles meerschaum. The resemblance may be much increased by coloring the mixture with solution of gamboge and dragon'sblood.

Meerschaum, to Cement. See **Cements.**

Meerschaum, to Boil and Color.—The bowls of the pipes, when imported into Germany, are prepared for sale by soaking them first in tallow, then in wax, and finally by polishing them with share grass. The coloring process as conducted by dealers is secret. The coloring for pipes is performed by a secret process, probably using some solvent of nicotine.

Meerschaum, to Color.—Ordinarily the pipe is boiled for coloring in a preparation of wax which is absorbed, and a thin coating of wax is held on the surface of the pipe, and made to take a high polish. Under the wax is retained the oil of tobacco, which is absorbed by the pipe, and its hue grows darker in proportion to the tobacco used. A meerschaum pipe at first should be smoked very slowly, and before a second bowlful is lighted the pipe should cool off. This is to keep the wax as far up on the bowl as possible, and rapid smoking will overheat, driving the wax off and leaving the pipe dry and raw. A new pipe should never be smoked outdoors in extremely cold weather.

2. Fill the pipe and smoke down about one-third, or to the height to which you wish to color. Leave the remainder of the tobacco in the pipe and do not empty or disturb it for several weeks, or until the desired color is obtained. When smoking, put fresh tobacco on the top and smoke to the same level.

3. When once burnt the pipe cannot be satisfactorily colored, unless the burnt portion is removed and the surface again treated by the process by which meerschaum is prepared. The coloring is produced by action of the smoke upon the oils and wax which are superficially on the exterior of the pipe, and are applied in the process of manufacture.

Substitute for Meerschaum (Bertolio's).—Make a hot solution of silicate of potash. Place in it carbonate of magnesia cut in small pieces. Let the pieces remain in the solution a few days, and then dry. Repeat several times, using a fresh hot solution of water glass, instead of silicate of potash. Expose the pieces to the air for a few months. In six or seven months the pieces are hard enough to be worked and closely resemble meerschaum.

2. Make a solution of 4 parts of sulphuric acid in 50 parts of water. Treat peeled potatoes with this solution for thirty-six hours. Dry the mass between blotting paper and press. Pipes may be made of this material which closely resemble meerschaum. By using very strong pressure, billiard balls have been made, closely resembling ivory. The material can be carved.

Melting Points. See **Temperature, Effects of.**

Menthol.—Menthol cones are made by mixing menthol with various waxes. It is the proximate principal in oil of peppermint, and can be obtained by cooling the oil to 15° C., whereupon the menthol crystallizes out of the oil.

Mercury, to Purify.—Place the mercury in a deep vessel with dilute acid over it, and introduce a piece of copper into it, weighting the copper to make good contact. The local action dissolves all impurities. If continued too long the mercury becomes a sulphate.

Mercury, to Remove from Gold.—Heat it very carefully to a temperature of 100° Fah. It is best to intrust it to a jeweler, if not experienced, as you may melt it.

Metal.—A metal is an element possessing a luster, and the higher oxides of which only are acid-forming compounds. Metals have the following properties, a specific gravity usually greater than one. The specific heat is less than unity, and this heat varies inversely as the atomic weight of that element. The conductivity of the metals is greater than that of either the non-metals or their compounds

The influence of heat upon metals is very varied; some melt at a low temperature, others require a red heat, a strong red, or a white

heat respectively, to melt them. The following table, by Pouillet, will explain the temperatures corresponding to different colors:

	Corresponds to	
	525° C.	977° F.
Incipient red heat	700	1,292
Dull red	800	1,472
Incipient cherry red	900	1,652
Cherry red	1,000	1,832
Clear cherry red	1,100	2,012
Deep orange	1,200	2,192
Clear orange	1,300	2,372
White	1,400	2,552
Bright white	1,500	2,732
Dazzling white		

Metals, to Black, Blue, Brown, Clean, Gild, Silver, Weld, etc. See the names of the operation to be performed, and also the name of the metal.

Metal, Cements for. See **Cements.**

Metal Cleansing Soap. See **Soaps.**

Metals, Coloring of. See the name of the metal to be colored, and also **Bluing, Browning, Bronzing, Blacking,** etc.

Metal, Fancy Coloring of.—The coloring matter of small objects in metal has recently occupied the attention of manufacturers and chemists, and M. Pushec, a German chemist, gives the following recipes for the application of sulphur to the purpose referred to: 1. A solution is made in the following manner: Dissolve 4 oz. of the hyposulphite of soda in 1½ pt. of water, and then add a solution of 1 oz. of acetate of lead in the same quantity of water. Articles to be colored are placed in the mixture, which is then gradually heated to a boiling point. The effect of this solution is to give iron the effect of blue steel; zinc becomes bronze; and copper or brass becomes successively yellowish, red, scarlet, deep blue, light blue, bluish white, and finally white, with a tinge of rose. This solution has no effect on lead or tin.

2. By replacing the acetate of lead in the solution by sulphate of copper, brass becomes first of a fine rosy tint, then green, and finally of an iridescent brown color. Zinc does not color in this solution—it throws down a precipitate of brown sulphuret of copper; but if boiled in a solution containing both lead and copper, it becomes covered with a black adherent crust, which may be improved by a thin coating of wax.

3. If the lead solution be thickened with a little gum tragacanth, and patterns be traced with it on brass, which is afterward heated to 212° F, and then plunged in solution No. 1, a good marked effect is produced.

Colored Films on Metals.—According to the prevailing fashion, the small metallic articles used for ladies' ornaments, such as buttons, buckles, clasps, etc., have different colored films produced on them by various methods. Some of these are known as oxidized silver.

Rainbow colors are produced on brass buttons by stringing them on a copper wire by the eyes, and dipping them in a bath of plumbate of soda freshly prepared by boiling litharge in caustic soda and pouring it into a porcelain dish. A linen bag of finely pulverized litharge or hydrated oxide of lead is suspended in the solution, so as to keep up the original strength of the solution. While the buttons are in this solution, they are touched one after the other with a platinum wire connected with the positive pole of a battery until the desired color appears. The galvanic current employed must not be too strong. The colors are more brilliant if they are heated after they have been rinsed and dried.

Colored films are more conveniently produced upon bright brass by different chemicals, by painting with them or by immersion. For example:

Golden Yellow.—By dipping in a perfectly neutral solution of acetate of copper.

Dull Grayish Green.—Repeatedly painting with very dilute solution of chloride of copper.

Purple.—Heating them hot and rubbing over with a tuft of cotton suturated with chloride of antimony.

Golden Red.—A paste made of 4 parts of prepared chalk and one part of mosaic gold.

In covering an article with any colored bronze in powder, it is first rubbed with a very little linseed oil, and the bronze dusted evenly over it from a dust bag. It is afterward heated in an iron pan to about 480° F.

In recent times small articles are also roughened by dipping in strong nitric acid, and, after washing and drying, they are coated with a rapidly drying alcohol varnish that has been colored yellow with picric acid, red with fuchsine, purple with methyl violet, or dark blue with an aniline blue. This gives the desired color with a beautiful metallic luster. These latter colors are not very durable, and are used for inferior goods.—*N. Erfind.*

Metal, Enamel for. See **Enameling.**

Metals, Lacquers for. See **Lacquers.**

Melting Points of Metals.

Metals.	Centigrade degrees.	Fahrenheit degrees.
Aluminum	700	1,292
Antimony	425	797
Arsenic	185	365
Bismuth	264	507·2
Cadmium	320	608
Cobalt	1,200	2,192
Copper	1,091	1,995·8
Gold	1,381	2,485·8
Indium	176	348·8
Iron, wrought	1,530	2,786
Iron, cast	1,200	2,192
Iron, steel	1,400	2,552
Lead	334	617
Magnesium	235	455
Mercury	—40	—40
Nickel	1,600	2,912
Potassium	62	143·6
Platinum	2,600	4,712
Silver	1,040	1,904
Sodium	96	172·8
Tin	235	455
Zinc	412	773·6

Metal Objects, to Find the Weight of,—To find the weight in pounds of metal objects, measure the number of cubic inches contained in the piece for wrought iron by 0·2816 cast iron, 0·2607; copper, 0·32418; lead, 0·41015 brass, 0·3112.

Metals, Paints for. See **Paints.**

Relative Conducting Power of Metals.—The following table gives the relative conducting power of pure metals and other conductors according to Dr. Matthiessen:

Silver	100·0	Thallium	9·2
Copper	99·9	Lead	8·3
Gold	77·9	Arsenic	4·8
Zinc	29·0	Antimony	4·6
Cadmium	23·7	Mercury	1·6
Palladium	18·4	Bismuth	1·2
Platinum	18·0	Graphite	0·069
Cobalt	17·2	Gas coke	0·038
Nickel	13·1	Bunsen's coke	0·025
Tin	12·4		

Metals, to Silver. See **Silvering.**

Metallography (method for producing drawings of all kinds in relief upon metal) Zach.—Grind and polish the surface of a zinc plate and cover it with a ground composed of white wax, 3 parts; mastic, 3 parts; asphalt, 1½ parts; colophony, ¾ part. Smoke with a wax

torch until it has a luster. Execute the drawing on this ground with a graver. Surround the plate with a rim of wax; etch fifteen to twenty minutes with dilute nitric acid. Wash with water, cover the fine lines, if desired, with asphalt dissolved in oil of turpentine. Continue the etching fifteen to twenty minutes longer. Dissolve off the ground with oil of turpentine and clean the plate. A sunk drawing is obtained in this way which must have such a depth that a casting made from it will have sufficient relief to allow of its being printed from in a printing press. A drawing in relief may be obtained from this matrix suitable for printing, in the following way. Make a readily fusible metal, bismuth, 3½ parts; lead, 2 parts; tin, 2 parts. Melt. Place the etched drawing in a heated mould and pour the melted fusible metal over it vertically. The drawing will lie in relief upon the casting.

Metheglin. — From honey, 1 cwt.; warm water, 24 gal.; stir well until dissolved; the next day add of yeast, 1 pt., and hops, 1 lb., previously boiled in water, 1 gal., along with water q. s. to make the whole measure 1 barrel; mix well and ferment the whole with the usual precautions adopted for other liquors. It contains on the average from 7% to 8% alcohol.

Methyl.—Wood alcohol; it has a peculiar odor. Methylated Spirit. — Ordinary alcohol when mixed with 10% methyl. See **Alcohol.**

Metric Measures. See **Appendix.**

Mica, Cement for. See **Cements.**

Mica, to Pulverize.—When mica is heated to redness for some time in a muffle and then allowed to cool rather quickly the laminæ become distorted and the sheets present a silvery-white appearance by reflected light, the mineral losing much of its flexibility. The dust of this whitened mica is used to some extent by the French as a silver bronze powder. Mixed with a weak solution of gum arabic it makes a good silver ink. The powder is sometimes variously tinted by washes of very dilute colored solutions of gums or varnishes. To prepare the glistening powder the sheets of whitened mica are simply crushed, not ground, boiled in hydrochloric acid, rinsed, dried, and assorted to size of laminæ. The finer filaments have a pearly luster and are made to adhere to semi-softened gelatine and wax to imitate pearl. The silvery powder is used on metals, glass, wood, paper, plaster. tapestry and furniture. It has also been used in calico printing in place of the heavy bronze and glass dust of Lyons fabrics, and for the decoration of china and glassware.

Mice, to Destroy.—1. Use tartar emetic mingled with some favorite food. The mice will leave the premises.

2. Take 1 part calomel, 5 parts wheat flour, 1 part sugar, and $\frac{1}{10}$ part of ultramarine. Mix together in a fine powder and place in a dish. This is a most efficient poison for mice.

3. Any one desirous of keeping seeds from the depredations of mice can do so by mixing pieces of camphor gum in with the seeds. Camphor placed in drawers or trunks will prevent mice from doing them injury. The little animal objects to the odor and keeps a good distance from it. He will seek food elsewhere.

4. Gather any kind of mint and scatter about your shelves, and they will forsake the premises.

Microcosmic Salt.—This salt is sodium-ammonium phosphate, with the symbol $HNa\,NH_4\,PO_4 + 4\,H_2\,O$. To prepare, dissolve 5 parts sodium phosphate with 2 parts ammonium phosphate in hot water and allow the solution to cool. It is used in blowpipe analysis.

Microscopy.—This subject is arranged in alphabetical order as closely as possible. Good microscopical receipts are rare. The following come from the best authorities. The majority of the receipts are not adapted to the use of the beginner, who should consult such books as Geo. E. Davis' *Practical Microscopy*. Many of the receipts, as well as the introduction, are from *Lee*.

Introduction.—The methods of modern microscopic anatomy may be roughly classed as General and Special. There is a General or Normal method, known as the method of sections, which consists in carefully fixing the structures to be examined, *staining* them with a *nuclear* stain, dehydrating with alcohol, and mounting series of sections of the structures in balsam. It is by this method that the work is blocked out and very often finished. Special points are then studied, if necessary, by special methods, such as examination of the living tissue elements, in situ, or in "indifferent" media; fixation with special fixing agents; staining with special stains; dissociation by teasing or maceration; injection; impregnation; and the like.

The General Method.—The first thing to be done with any structure is to fix its histological elements. (This statement applies equally to all classes of objects, whether it be desired to cut them into sections or to treat them in any other special way.) Two things are implied by the word "fixing;" first, the *rapid killing* of the element, so that it may not have time to change the form it had during life, but is fixed in death in the attitude it normally had during life; and second, the *hardening* of it to such a degree as may enable it to resist without further change of form the action of the reagents with which it may subsequently be treated. Too much stress can hardly be laid on this point, which is the most distinctive feature of modern histological practice; without good fixation it is impossible to get good stains, or good sections, or preparations good in any way.

The structure having been duly fixed by one of the processes described in the section on fixing agents, is washed in order to remove from the tissues as far as possible all traces of the fixing reagent

The kind of liquid with which washing out is done is not a matter of indifference. If corrosive sublimate, for instance, or osmic acid, or a solution into which chromic acid or a chromate enters, have been used for fixing, the washing may be done with water. But if picric acid in any form has been used, the washing must be done with alcohol. The reason of this difference is that the first named reagents (and, indeed, all the compounds of the heavy metals used for fixing) appear to enter into a state of chemical combination with the elements of tissues, rendering them insoluble in water; so that the hardening induced by these agents is not removed by subsequent treatment with water. Picric acid, on the other hand, produces only a very slight hardening of the tissues, and does not appear to enter into any combination whatever with their elements, as it is entirely removable by treating the tissues with water or alcohol. If the removal be effected by means of water, the tissue elements are left in a soft state in which they are obnoxious to all the hurtful effects of water. Alcohol must therefore be taken to remove the picric acid and to effect the necessary hardening at the same time.

At the same time that the superfluous fixing agent is being removed from the tissues, or as soon as that is done, the water of the tissues must be removed. This is necessary for two reasons; firstly, in the interest of preservation, the presence of water being the condition of all others that most favors post mortem decomposition; and secondly, because all water must be removed in order to allow the tissues to be impregnated with the imbedding material necessary for section cutting, or with the balsam with which they are to be finally preserved. (The cases in which aqueous imbedding and preserving media are employed are

exceptional, and will be treated of in the proper places.) The dehydration is performed as follows: the objects are brought into weak alcohol, and are then passed through successive alcohols of gradually increased strength—for instance, 50% two hours, 70% six to twenty-four hours, 80% several hours, 95% two or three hours, absolute alcohol, time enough for complete saturation. (Very small objects, so small that section cutting is not necessary, may be dehydrated much quicker than this. Infusoria may be prepared in a few minutes.)

The water having been thus completely removed, the alcohol is in its turn removed from the tissues, and its place taken by some anhydrous substance, generally an essential oil, which is miscible with the material used for imbedding. This operation is known as *Clearing*. It is very important that the passage from the last alcohol to the clearing agent be made gradual. This is effected by placing the clearing medium under the alcohol. A sufficient quantity of alcohol is placed in a tube (a watch glass will do, but tubes are generally better), and then with a pipette a sufficient quantity of clearing medium is introduced at the bottom of the alcohol. Or you may first put the clearing medium into the tube, and then carefully pour the alcohol on to the top of it. The two fluids mingle but slowly. The objects to be cleared being now quietly put into the supernatent alcohol, float at the surface of separation of the two fluids, the exchange of fluids takes place gradually, and the objects slowly sink down into the lower layer. When they have sunk to the bottom, the alcohol may be drawn off with a pipette, and the objects will be found to be completely penetrated by the clearing medium. (It may be noted here that this method of making the passage from one fluid to another applies to all cases in which objects have to be transferred from a lighter to a denser fluid—for instance, from alcohol, or from water, to glycerine. It is a more exact method than that of successive baths of mixture of alcohol and clearing agent.)

The objects are now *imbedded*. They are removed from the clearing medium, and soaked until thoroughly penetrated in the imbedding medium. This is, for small objects, generally paraffine, liquefied by heat, and for large objects generally a solution of collodion or celloidin. The imbedding medium containing the object is then made to solidify, as described in the chapter on imbedding processes, and sections are made with a microtome through the imbedding mass and the included objects. The sections are then mounted on a slide, the imbedding material is removed from them (in the case of paraffine), they are stained in situ on the slide, dehyrated with alcohol, cleared, and mounted in balsam or dammar. Or they may be stained, washed, dehydrated, and cleaned in watch glasses, and afterward mounted as desired, the imbedding medium being first removed if desirable.

It is not always desirable to remove the imbedding mass; celloidin sections stain well without being freed from it, and are usually even dehydrated, cleared, and mounted without removal of the mass, which becomes quite transparent in balsam. This plan has the advantage, which is a very important one for large sections, of allowing the sections to remain during the whole of the manipulations protected by a supporting mass that holds all their parts together.

The plan of staining sections on the slide is of somewhat recent introduction; before it had been worked out the practice was to stain structures in toto, before cutting sections. And in cases in which structures are sufficiently small and permeable to allow of satisfactory staining in this way, and if it be not essential to save time, this plan is sometimes as good as the one described. In this case the object, after having been fixed and washed out, is taken from the water, or while still on its way through the lower alcohols (it should not be allowed to proceed to the higher grades of alcohol before staining, if that can be avoided), and passed through a bath of stain (generally alcoholic borax carmine or other alcoholic stain) of sufficient duration, then dehydrated with successive alcohols, passed through a clearing medium into paraffine, cut, and treated as above described, the sections in this case being mounted direct from the turpentine, naphtha, or other solvent with which the paraffine is removed. If aqueous staining media be employed (and it is sometimes very desirable for particular purposes to prepare specimens with some aqueous stain) the structures should either be stained in toto immediately after fixing and washing out, or sections may be stained on the slide, the objects being passed through successive baths of alcohol of gradually decreasing strength before being put into the aqueous stain (a precaution which will not be necessary for chromic objects).

It was stated in the first edition of this work that the great majority of preparations are made by fixing either with sublimate or a picric acid combination, washing out with alcohol, staining with alcoholic borax carmine, imbedding in chloroform-paraffine, cutting with a sliding microtome, and mounting the sections in series in Canada balsam. That is probably still the case, but the method can no longer claim to be what it then appeared to be, the classical method of microscopic anatomy. I suggest the following, as being quite as easy to carry out, and as giving preparations far richer in detail and more truthfully preserved: Fix in Flemming's chromo-acetoosmic mixture; wash out with water; dehydrate; clear with oil of cedar wood; imbed in paraffine; mount sections on the slide with Mayer's albumen medium; stain with safranine, or double stain with gentian violet and eosin; and mount in balsam or dammar. That or something like that is now the practice of many of the most advanced workers; and I know of no method that seems to have equal claims to be considered a classical method of general morphological investigation.

The treatment of objects which can be studied without being cut into sections is identical with that above described, with the omission of those passages that relate to imbedding processes. Its normal course may be described as fixation, washing out with alcohol, staining with alcoholic borax carmine, or some other alcoholic stain, treatment with successive alcohols of gradually increasing strength, final dehydration with absolute alcohol, clearing, and mounting in balsam. This method, which may be termed the dehydration method, is generally preferred, as a general method, to what may be termed the wet methods, by which objects are prepared and preserved in aqueous media. The chief reason for this lies in the great superiority of the dehydration methods as regards the preservation of tissues. The presence of water is the most important factor in the conditions that bring about the decomposition of organic matter, and its complete removal is the chief condition of permanent preservation.

In the preparation of entire objects or structures that are intact and covered by an integument not easily permeable by liquids, special care must be taken to avoid swelling from endosmosis on the passage of the objects from any of the liquids employed to a liquid of less density, or shrinkage from exosmosis on the passage to a liquid of greater density. This applies most specially to the passage from the last alcohol into the clearing medium. A slit should be made in the integument, if possible, so that the two fluids may mingle without hindrance. And in all cases the passage is made gradual by placing the clearing medium under the alcohol as above described. Fluids

of high diffusibility should be employed as far as possible in all the processes. Fixing agents of great penetrating power (such as picrosulphuric acid or alcoholic sublimate solution) should be employed where the objects present not an easily permeable integument. Washing out is done with successive alcohols, water being used only in the case of fixation by osmic acid, or the chromic mixtures or other fixing solutions that render washing by water imperative. Staining is done by preference with alcoholic staining media. The stains most used are Grenacher's borax carmine, Mayer's modification of Grenacher's alcoholic carmine, and Kleinenberg's hæmatoxylin (for these see *Staining Agents*). Aniline stains are rarely applicable to this class of preparations. Aqueous stains are more seldom used, though there are many cases in which they are admissible, and some in which they are preferable.

Minute dissections are best done, if necessary, in a drop of clearing agent. I recommend cedar wood oil for this purpose, as it gives to the tissues a consistency very favorable for dissection, while its viscosity serves to lend support to delicate structures. Clove oil has a tendency to make tissues that have lain in it for some time very brittle. This brittleness is also sometimes very helpful in minute dissections. Another property of clove oil is that it does not easily spread itself over the surface of a slide, but has a tendency to form very convex drops. This property also makes it frequently a very convenient medium for making minute dissections in.

Following Paul Mayer, I gave in the first edition the following reasons for employing alcoholic rather than aqueous staining media. Since, in most cases, treatment with alcohol forms part of the fixing process, alcoholic solutions are logically indicated for staining. For by means of them it is possible to avoid the bad effects that follow on passing delicate tissues from alcohol into water, violent diffusive currents being thereby set up which sometimes carry away whole groups of cells, swellings being caused in the elements of the tissues; and, if the immersion in the aqueous medium be prolonged, as is generally necessary in order to obtain a thorough stain, maceration of the tissues supervening. But alcoholic staining fluids have still other advantages; they are vastly more penetrating; with them alone is it possible to stain through chitinous integuments; and if it be desired to stain slowly, tissues may be left in them for days without hurt.

Applied to the case now under consideration the preparation in toto of objects protected by not easily permeable investments, this doctrine is evidently a wise one. For such objects must necessarily be fixed by some *highly penetrating* but not permanently hardening agent, such as picric acid, and must necessarily be washed out with alcohol; and it is a good maxim for tissues so fixed that an object that has once been in alcohol should not be allowed to go back into water, if that can possibly be avoided.

But in the case of structures that have been well fixed in a strongly and permanently coagulating medium, such as chromic acid, this precaution is much less necessary. Sections of tissues that have been fixed for twenty-four hours in Flemming's solution maybe passed with relative impunity from absolute alcohol into an aqueous stain, and from that back again direct into absolute alcohol. It is this property of tissues fixed in chromic solution that determines me to recommend the practice of staining sections, instead of staining objects in toto.

For an excellent exposition of the principles underlying the practice above recommended, the reader may consult with advantage the paper of Paul Mayer in *Mitth. Zool. Stat. Neapel*, ii (1881), et seq. See also the abstract in *Journ. Roy. Mic. Soc.* (N. S.), ii (1882), and that in *Amer. Natural.* xvi (1882), in which two last some improvements are mentioned which have been worked out since the publication of Mayer's paper.—*Arthur Bolles Lee, in Microtomists' Vade Mecum.*

Bleaching.—Marsh's Chlorine Method (*Section Cutting*).—Marsh generates chlorine in a small bottle by treating crystals of chlorate of potash with strong HCl, and leads the gas (by means of a piece of glass tubing bent twice at right angles) to the bottom of a bottle containing the sections in water. (See a figure of the apparatus in *Journ. Roy. Mic. Soc.*, iii, 1880, p. 854.)

Chlorine Solution (Sargent's Method).—Hydrochloric acid, 10 drops; chlorate of potash, 1½ drm.; water, 1 oz. Soak for a day or two. Wash well.

This method is intended for bleaching insects; it will be seen that it is only applicable to the preparation of hard parts, as soft tissues would be destroyed by the solution.

Creosote (Pouchet's method, *Journ. de l'Anat.*, 1876.)—I gather from the paper here quoted that most of the granular animal pigments are soluble in creosote. Other solvents are mentioned in this paper ("On the Change of Coloration through Nervous Influence"), but this appears to be the only one capable of general histological application.

Nitric Acid.—Nitric acid has a similar action.

Oxygenated Water (Pouchet's method. M. Duval, *Précis, etc.*).—Macerate in glycerine to which has been added a little oxygenated water (5 to 6 drops to a watch glass of glycerine).

Also Labarraque's Solution and Javelle Water, which see in the general alphabet.

Cements, Microscopic. See also **Cements**—*Bell's brown, Gram-Kutzons, gelatine, gutta percha, Kittons', Lovett's, Stieda's white zinc cement and zinc cements.*

Goadby's Marine Glue.—Dissolve separately in coal naphtha equal parts of shellac and India rubber. Mix thoroughly with heat.

Clearing Agents.—Clearing agents are liquids, one of whose functions it is to make microscopic preparations transparent by penetrating among the highly refracting elements of which the tissues are composed, the clearing liquids themselves having an index of refraction not greatly inferior to that of the tissues to be cleared. Hence all clearing agents are liquids of high index of refraction.

Classification of Clearing Agents (Stieda).—Stieda's experiments with essential oils led him to establish the following classification:

a. The turpentine group, capable of clearing in a short time perfectly dehydrated sections, but clearing watery sections only after many hours or not at all.

Ol. Terebinthinæ.	Ol. Absynthii.
Ol. Balsam Copaivæ.	Ol. Cortic Aurantiorum.
Ol. Cubebarum.	
Ol. Fœniculi.	Ol. Millefolii florum.
Ol. Sassafras.	Ol. Juniperi.
Ol. *Menthæ* crispæ.	Ol. Origani vulgaris.
Ol. Lavandluæ.	Ol. Cùmini.
Ol. Cajeputi.	Ol. Cascarillæ cortic.
Ol. Sabinæ.	Oi. Citri.

This, then, for Stieda, is the *Index Expurgatorius* of clearing media.

b. The oil of cloves group, clearing very rapidly sections that have been dehydrated, and clearing watery sections "somewhat more slowly" and with a certain amount of shrinkage.

Ol. Gaultheriæ.	Ol. Cassiæ.
Ol. Cinnamomi.	Ol. Anisi stellati.
Ol. Bergamotti.	Ol. Cardamomi.
Ol. Coriandri.	Ol. Roris marini.
Ol. Carui.	

But Stieda found creosote preferable to any of these.

Corrosion.—Caustic Potash, Caustic Soda, Nitric Acid.—Boiling, or long soaking in a strong solution of either of these, is an efficient means of removing soft parts from skeletal struct-

ures (appendages of anthropods, spicula of sponges, etc.).

Also Javelle Water and Labarraque's Solution—which see in general alphabet.

Decalcification.—The most widely used agent for decalcification is hydrochloric acid. Its action is rapid, even when very dilute, but it has the disadvantage of causing serious swelling of the tissues. To remedy this chromic acid may be combined with it, or alcohol may be added to it. Or a 3% solution of the acid may be taken and have dissolved in it 10 to 15% of common salt. Or (Waldeyer) to a $\frac{1}{1000}$% solution of chloride of palladium may be added $\frac{1}{10}$ of its volume of HCl. Nitric acid also used.

Nitric Acid and Alcohol.—Three % of nitric acid in 70% alcohol. Soak specimens for several days or weeks. I do not know who first recommended this admirable medium.

Chromic acid is employed in strengths of from 0·1% to 1%, the maceration lasting two or three weeks (in the case of bone). It is better to take the acid weak at first and increase the strength gradually.

Chromic and Nitric Acid.—Dissolve 15 grn. pure chromic acid in 7 oz. of distilled water, to which 30 minims of nitric acid are afterward added. Macerate for three or four weeks, changing the fluid frequently.—*Marsh.*

Fol takes 70 volumes of 1% chromic acid, 3 of nitcic acid and 200 of water.—*Lehrb.*

Examination and Preserving Media.—Artificial Iodized Serum.—Frey, *Le Microscope*, p. 131.

Distilled water	135	grm.
White of egg	15	grm.
Sodium chloride	0·20	grm.

Mix, filter and add—

Tincture of iodine	3	grm.

There is formed a precipitate which is removed by filtering through flannel, and a little iodine is added to the filtrate.

Kronecker's Artificial Serum (from Vogt et Yung, *Traité d'Anat. comp. prat.*, p. 473. I have been unable to discover the original source).

Common salt	6	grm.
Caustic soda	0·06	grm.
Distilled water	1000	grm.

Carbolized Sirup.—Carbolic acid may be employed instead of chloral; 1% is sufficient.

Either of these sirups may be used as a mounting medium, but they are not to be recommended for that purpose, as there is always risk of the sugar crystallizing out.

A good strength for sirup is equal parts of loaf sugar and water. Dissolve by boiling.

Pacini's Fluids.—Pacini remarks that bichloride of mercury coagulates and precipitates the albuminous matter that exists in the interstitial fluids of the tissues, and therefore in order to prevent this coagulation it is well to associate with it salt for certain preparations, or acetic acid for others. On this principle are prepared the following classical fluids of Goadby and Pacini.

Fluid No. 1.

Bichloride of mercury	1 part.
Common salt	2 parts.
Water	200 parts.

Of general employment, but especially useful for blood corpuscles of cold blooded animals, as it has a less density than the following fluid. It preserves spermatic fluid, epithelia, nerves and muscle fibers. It is also used for fixing infusoria, a small quantity being added to the water containing them.

Fluid No. 2.

Bichloride of mercury	1 part.
Common salt	4 parts.
Water	200 parts.

For blood corpuscles of warm blooded animals.

Fluid No. 3.

Bichloride of mercury	1 part.
Acetic acid	2 parts.
Water	300 parts.

Serves best for the nuclei of animal tissues, but it swells up the fibers and distorts the forms of the cells.

Fluid No. 4 (Frey, *Le Microscope*, 1867).—In the place here quoted Frey speaks of the liquids of Pacini as differing from those of Goadby through their containing glycerine in lieu of alum. He gives the following directions. Take

Sublimate	1 part.
Sodium chloride	2 parts.
Glycerine (25° Baumé)	13 parts.
Water	113 parts.

Allow the mixture to remain undisturbed for at least two months. At the end of that time take for use 1 part, mix with 3 parts of water and filter. This mixture is said to be a good preservative of all delicate tissues.

Fluid No. 5.—*Ibid.*

Sublimate	1 part.
Acetic acid	2 parts.
Glycerine (25° Baumé)	43 parts.
Water	115 parts.

This mixture is to be employed in the same way as the last. It is said to destroy red blood corpuscles, but to preserve white blood corpuscles.

Modifications of the Foregoing Sublimate Solutions.—The following formulæ are quoted by Frey from Cornil as being in use at the Pathological Institute of Berlin.

6. Sublimate 1 part.
   Sodium chloride 2 parts.
   Water 100 parts.

   For the more vascular tissues of warm blooded animals.

7. Sublimate 1 part.
   Sodium chloride 2 parts.
   Water 200 parts.

   For similar tissues of cold blooded animals.

8. Sublimate 1 part.
   Sodium chloride 1 part.
   Water 300 parts.

   For pus corpuscles and analogous elements.

9. Sublimate 1 part.
   Water 300 parts.

   For blood corpuscles.

10. Sublimate 1 part.
    Acetic acid 1 part.
    Water 300 parts.

    For epithelia, connective tissue and pus corpuscles, when it is desired to demonstrate the nuclei.

11. Sublimate 1 part.
    Acetic acid 3 parts.
    Water 300 parts.

    For ligaments, muscles and nerves.

12. Sublimate 1 part.
    Acetic acid 5 parts.
    Water 300 parts.

    For glandular tissues.

13. Sublimate 1 part.
    Phosphoric acid 1 part.
    Water 30 parts (sic).

    For cartilaginous tissues.

Owen's Fluid (quoted from Vogt et Yung, *Traité, d'Anat. comp. pratique*):

Corrosive sublimate	0·014	grm.
Alum	79	grm.
Salt	137	grm.
Water	1680	grm.

Said to be very useful for the preservation of soft bodied animals.

Gilson's Fluid (Carnoy's *Biologie Cellulaire*):

Alcohol of 60%	60 c. c.
Water	30 c. c.
Glycerine	30 c. c.
Acetic acid (15 parts of the glacial to 85 of water)	2 c. c.
Bichloride	0·15 grm.

A really excellent medium for the study of fine cellular detail with well fixed objects.

Gage's Albumen Fluid (*Zeit. f. wiss. Mik.*, 1886):

White of egg	150 c. c.
Water	200 c. c.
Corrosive sublimate	0·5 grm.
Salt	4 grm.

Mix, agitate, filter and preserve in a cool place. Recommended for the study of red blood corpuscles and ciliated cells.

Chloride and Acetate of Copper (Ripart et Petit's fluid, *Brebissonia*, 1880; Carnoy's *Biol. Cell.*):

Camphor water (not saturated)	75 grm.
Distilled water	75 grm.
Crystallized acetic acid	1 grm.
Acetate of copper	0·30 grm.
Chloride of copper	0·30 grm.

This is certainly a most valuable medium for work with delicate fresh tissues. It may be used in combination with methyl green, which it does not precipitate.

Fabre Domergue's Glucose Medium (*La Nature*, No. 823):

Glucose sirup diluted to 25° of the areometer (sp. gr. 1·1968)	1000 parts.
Methyl alcohol	200 parts.
Glycerine	100 parts.
Camphor, to saturation.	

The glucose is to be dissolved in warm water, and the other ingredients added. The mixture, which is always acid, must be neutralized by the addition of a little potash or soda.

This medium is said to preserve without change almost all animal pigments. If it really performs this, its great value is evident.

Glycerine and Alcohol Mixtures.—These most useful fluids afford one of the best means of bringing delicate objects gradually from weak into strong glycerine. The object is mounted in a drop of the liquid and left for a few hours or days, the mount not being closed. By the evaporation of the alcohol the liquid gradually increases in density, and after some time the mount may be closed, or the object brought into pure glycerine or glycerine jelly.

1. Calberla's Liquid:

Glycerine	1 part.
Alcohol	1 part.
Water	1 part.

A most valuable examination fluid.

2. Glycerine 1 part.
Alcohol 1 part.
Water 2 parts.

3. Haentsch's Liquid:

Glycerine	1 part.
Alcohol	3 parts.
Water	2 parts.

4. Jäger's Liquid (quoted from Vogt and Yung's *Traité d'Anat. comp. prat.*):

Glycerine	1 part.
Alcohol	1 part.
Sea water	10 parts.

Deane's Glycerine Jelly (from Frey's *Le Microscope*).—One hundred and twenty grm. glycerine, 60 gram. water, 30 grm. gelatin. Dissolve the gelatin in the water and add the glycerine. This, and the following glycerine jellies, must of course be used warm.

Beale's Glycerine Jelly (*How to Work, etc.*).—Gelatin or isinglass, soaked, melted and clarified, if desired, as in the last formula. To the clear solution add an equal bulk of strong glycerine.

Fol's Glycerine Jellies (*Lehrb.*).—1. Melt together 1 volume of Beale's jelly, and ½ to 1 volume of water and add 2 to 5% of salicylic acid solution or carbolic acid or camphor.

2. Gelatin 30 parts.
Water 70 parts.
Glycerine 100 parts.
Alcoholic solution of camphor 5 parts.

Prepare as before, adding the camphor last.

3. Gelatin 20 parts.
Water 150 parts.
Glycerine 100 parts.
Alcoholic solution of camphor 15 parts.

Fixing Agents.—1. Chromo aceto osmic acid (Flemming, first or weak formula, *Zellsubstanz, Kern und Zelltheilung*, 1882).

Chromic acid	0·25% in water.
Osmic acid	0·1% in water.
Glacial acetic acid	0·1% in water.

The best results as regards faithfulness of fixation are obtained with this mixture when it is allowed to act for only a short time, about half an hour.

2. Bichromate and Cupric Sulphate Mixture (Kultschitzky, *Zeit. f. wiss. Mik.*, iv, 3, 1887).—A saturated solution of bichromate of potash and sulphate of copper in 50% alcohol, to which is added at the instant of using a little acetic acid, five or six drops per 100 c. c.

To make the solution, add the finely powdered salts to the alcohol in excess, and leave them together in total darkness for twenty-four hours.

Fix for twelve to twenty-four hours in the dark; otherwise the salts will be precipitated. Then treat with strong alcohol for twelve to twenty-four hours, and make sections.

3. Corrosive Sublimate (Lang's formula, *Zool. Anzeiger*, 1878), for Planaria.—

Distilled water	100 parts by weight.
Chloride of sodium	6 to 10 parts.
Acetic acid	6 to 8 parts.
Bichloride of mercury	3 to 12 parts.
Alum, in some cases	½ part.

4. Platinum Chloride.—An extremely valuable reagent for the study of karyokinesis. Rabl, to whom we owe the introduction of this agent, employs an aqueous solution of 1·300. The objects remain in it for twenty-four hours, and are then washed with water, hardened in alcohol and sectioned. Stain with Delafield's hæmatoxylin, or with safranine.

5. Palladium Chloride.—Palladium chloride has been recommended by experienced workers. It is used in solutions of 1·300, 1·600, or 1·800 strength, for from one to two minutes. Cattaneo recommends it as being the best of fixatives for Infusoria. Tissues are impregnated and colored brown by it. For small objects one or two minutes will suffice for fixation.

This salt is found in commerce in the solid state. To dissolve it, take 10 grm. of the salt, 1 liter of water, and 4 to 6 drops of hydrochloric acid. Solution will be effected in twenty-four hours.

6. Gold Chloride.—When used for fixing and not for the object of staining by impregnation gold chloride is generally used in solution of ½% strength for a few minutes, 30 at most. Weaker solutions ¼% or stronger, 1 to 2% may also be used. Wash out with water.

7. Carnoy has given two formulæ for this important reagent. The first is:

Glacial acetic acid	1 part.
Absolute alcohol	3 parts.

The second:

Glacial acetic acid	1 part.
Absolute alcohol	6 parts.
Chloroform	3 parts.

The addition of chloroform is said to render the action of the mixture more rapid.

V. Beneden and Neyt take equal volumes of glacial acid and absolute alcohol.

Zacharias takes—

Glacial acetic acid	1 part.
Absolute alcohol	4 parts.
Osmic acid	A few drops.

Hardening Fluids.—1. Müller's Solution:

Bichromate of potash	2–2½ parts.
Sulphate of soda	1 part.
Water	100 parts.

The duration of the reaction is about the same as with the simple solution of chromic salts.

2. Erlicki's Solution (*Warschauer Med. Zeit.*, xxii., Nos. 15 and 18).

Bichromate of potash	2·5 parts.
Sulphate of copper	1·0 part.
Water	100·0 parts.

3. Sulphate of Copper.—This salt is seldom used alone, perhaps because it does not give a sufficiently favorable consistency to the tissues hardened by it. I take from the *Lehrbuch* the following formula, which was first published by Remak, then modified by Goette, and is said to be useful for hardening the ova of amphibia:

Two per cent. solution of sulphate of copper	50 c. c.
Alcohol of 25%	50 c. c.
Rectified wood vinegar	35 drops.

4. Picric acid is a weak hardening agent, little used. It should be employed in saturated solution.

5. Chromic Acid.—Chromic acid is generally employed in strengths of ⅛% to ½%, the immersion lasting a few days or a few weeks, according to the size and nature of the object. Mucous membrane, for instance, will harden satisfactorily in a few days, brain will require some six weeks.

Injecting and Staining Fluids.—1. Prussian Blue Fluid.—Glycerine, 1 oz.; alcohol, 1 oz.; ferrocyanide of potassium, 12 grn.; perchloride of iron, 1 drm.; water, 4 oz. Dissolve the potassium in 1 oz. of the water and glycerine and the iron added to another ounce. Mix gradually, add the iron solution to the potassium solution. Then add the alcohol and water.

2. Turnbull's Blue.—Ferridcyanide of potassium, 10 grn.; sulphate of iron, 5 grn.; water, 1 oz.; glycerine, 2 oz.; alcohol, 1 drm. Proceed as above.

3. Carmine.—Use carmine in ammonia.

4. Carmine.—Carmine, 77 grn.; water, 70 grn.; ammonia, 8 drops. Dissolve the carmine in the ammonia and water. Expose to the air, then mix with gelatine ½ drm. in 1¾ drm. water. Add a few drops acetic acid, inject warm.

5. Acid Carmine Fluid.—Carmine, 5 grn.; glycerine (with 8 drops acetic acid), ½ oz.; glycerine, 1 oz.; alcohol, 2 drm.; water, 6 drm.; ammonia, a few drops. Mix the carmine with a little water, then add 5 drops of the ammonia. Then ½ oz. of glycerine, shake, and add the acid glycerine. Then add the alcohol and water. Shake well.

6. Dr. Carter's Carmine Fluid.—Carmine, 60 grn.; strong ammonia, 120 grn.; glacial acetic acid, 86 minims; solution gelatine (1 to 6) 2 oz.; water, 1½ oz. Dissolve the carmine in ammonia, then add 1½ oz. of the gelatine; to the remaining ½ oz. gelatine add the acid; drop into the carmine solution.

7. Yellow.—A. Bichromate of potash, 1 oz.; water, 2 oz. B. Lead nitrate, same proportion; 1 part solution A is mixed with 4 parts concentrated solution of gelatine; 2 parts solution B are placed in another vessel and mixed with 4 parts jelly (gelatine ?). These are heated together at a temperature of 75° to 90°, then heat in a water bath to 212° F. for ½ hour. Filter through flannel.

Ferrocyanide of Copper Coloring Mass:

1. Ferrocyanide of potassium (concentrated solution)	20 c. c.
Glycerine	50 c. c.
2. Sulphate of copper (concentrated solution)	35 c. c.
Glycerine	50 c. c.

Mix 1 and 2 slowly, with agitation; at the moment of injecting combine with 3 volumes of vehicle.

Blue Coloring Mass (Prussian Blue) (*Robin's modification of Beale's formula*):

1. Sulphocyanide of potassium (sol. sat.)	90 c. c.
Glycerine	50 c. c.
2. Liquid perchloride of iron at 30°	3 c. c.
Glycerine	50 c. c.

Mix slowly and combine the mixture with 3 parts of vehicle. It is well to add a few drops of HCl.

Cadmium Coloring Mass:

Sulphate of cadmium (sol. sat.)	40 c. c.
Glycerine	50 c. c.
Sulphide of sodium (sol. sat.)	30 c. c.
Glycerine	50 c. c.

Mix with agitation and combine with 3 volumes of vehicle.

Scheele's Green Coloring Mass:

Arseniate of potash (saturated solution)	80 c. c.
Glycerine	50 c. c.
Sulphate of copper (saturated solution)	40 c. c.
Glycerine	50 c. c.

Mix and combine with 3 volumes of vehicle.

Robin's Carmine Glycerine Mass (*Traité*, p. 33) consists of the following vehicle:

Glycerine	2 parts.
Alcohol	1 part.
Water	1 part.

Combined with one-third or one-fourth its volume of the carmine coloring mass.

Emery's Aqueous Carmine.—To a 10% ammoniacal solution of carmine is added acetic acid, with continual stirring, until the color of the solution changes to blood red through incipient precipitation of the carmine. The supernatant clear solution is poured off, and injected cold without further preparation. The injected organs are thrown at once into strong alcohol to fix the carmine. For injection of fishes.

Letellier's Vanadate of Ammonia and Tannin (*Journ. Roy. Mic. Soc.*, 1889).—Vanadate of ammonia is soluble in warm, and tannin in hot water. The two solutions are kept apart until required for use, when they are mixed according to the tint required. A black mass, very fine. The walls of vessels are stained black by it.

Taguchi's Indian Ink (*Arch. f. mik. Anat.*, 1888, *Zeit. f. wiss. Mik.*, 1888).—Chinese or (better) Japanese ink well rubbed up on a bone until a fluid is obtained that does not run when dropped on thin blotting paper nor form a gray ring round the drop. Inject until the preparation appears quite black, and throw it into some hardening liquid (not pure water).

Killing Agents.—1. Chloroform may be employed either in the liquid state or in the state of vapor. Korotneff operates in the following manner with Siphonophora: The animals being extended, a watch glass containing chloroform is floated on the surface of the water in which they are contained, and the whole is covered with a bell glass. As soon as the animals have become insensible, they are killed by means of hot sublimate or chromic acid solution plentifully poured on to them.

2. Liquid chloroform is employed by squirting it in small quantities on to the surface of the water containing the animals. A syringe or pipette having a very small orifice, so as to thoroughly pulverize the chloroform, should be employed. Small quantities only should be projected at a time, and the dose should be repeated every five minutes, until the animals are anæsthetized.

3. Cocaïn (Richard; Zool. Anz., 196, 1885) has been found to give good results. Richard puts a colony of Bryozoa into a watch glass with 5 c. c. of water, and adds gradually 1% solution of hydrochlorate of cocaïn in water. After five minutes, the animals are somewhat numbed, and half a cubic centimeter of the solution is added, and the tentacles are caused to contract by irritating them with a needle. Ten minutes later the animals should be found to be dead in a state of extension.

4. Hydrate of Chloral, which was first recommended, I believe, by Foettinger (*Arch. de Biol.*, vi, 1885, p. 115), gives very good results with some subjects. Foettinger operates by dropping crystals of chloral into the water containing the animals. For Alcyonella he takes 25 to 80 centigrammes of chloral for each hundred grammes of water. It takes about three quarters of an hour to render a colony sufficiently insensible to allow of fixing. Foettinger has obtained satisfactory results with marine and fresh water Bryozoa, with Annelida, Mollusca, Nemertians, Actiniæ, and with *Asteracanthion*. He did not succeed with Hydroids.

Preservative and Mounting Media.—The following receipts have been in great part translated and adapted from Dr. Behren's "*Tabellen zum gebrauch bei Mikroskopischen Arbeiten.*" A glance at the receipts will generally give all the information necessary to any one fairly familiar with micro-manipulation.

1. Alcohol-glycerine: Glycerine, 1 part; alcohol, 96%, 1 part; water, 1 part. Specially recommended for plants, entire or in parts.

2. Canada balsam in alcohol, chloroform, benzol, turpentine, xylol: The balsam is hardened by low heat until brittle when cold, broken up or pulverized, dissolved in the solvents, filtered through paper and evaporated until of the thickness of sirup.

3. Boroglyceride: Dissolve as much boracic acid in warm glycerine as possible. The solution is thick when cold; used for mounting animal or plant preparations in the same way as balsam.

4. Canada Balsam: The thick balsam is heated and the mounting done on the warm table; the object must first be soaked in absolute alcohol, then in oil of cloves.

5. Glycerine and carbolic acid: Glycerine, 100 grm.; absolute alcohol, 50 grm.; water, 50 grm.; carbolic acid, 3 grm. For plant sections, etc.

6. Chloride of calcium: Concentrated or 33%, 25%, 12%. For vegetable preparations, etc.

7. Dammar: Dissolve gum dammar in equal parts of benzol and turpentine; the solution is filtered and evaporated to sirupy thickness.

8. Farrant's medium: Gum arabic, 1 oz.; glycerine, 1 oz.; water, 1 oz.; arsenious oxide, 1½ grn. Dissolve the oxide in water, then the gum, without heat; when entirely dissolved, add the glycerine; take care not to form bubbles; can be filtered through fine flannel. Specially recommended for delicate plant or animal tissues.

9. Glycerine: Concentrated or diluted with water, to which may be added a few drops of acetic or carbolic acid. For vegetable or animal preparations.

10. Glycerine jelly: Glycerine, 120 grm.; water, 60 grm.; gelatine, 30 grm. Dissolve the gelatine in warm water, add the glycerine, filter, if necessary, through flannel. All forms of glycerine jelly must be used warm. For vegetable and animal tissues.

11. Deane's medium: Similar to glycerine jelly, but with the addition of honey and a small quantity of alcohol. Used in place of glycerine jelly.

12. Glycerine salicylic vinegar: Glycerine, 1 vol.; water, 4 vol.; salicylic vinegar, 0·1 vol. For infusoria.

13. Glycerine salicylic vinegar for larvæ, hydra, nematodes, etc.: Glycerine, 1 vol.; water, 2 vol.; salicylic vinegar, 0·1 vol. Salicylic vinegar is made by dissolving 1 part salicylic acid in 100 parts pyroligneous acid, sp. gr. 1·04.

14. Goadby's medium: Corrosive sublimate, 0·25 grm.; alum, 60 grm.; boiling water, 2,300 grm.

15. Gum with chloral hydrate: Gum arabic, chloral hydrate, water. A cylinder 60 c. c. contents is filled ⅔ with gum arabic in pieces; to this is added a solution of chloral hydrate (several %) containing 5—10% of glycerine; shake often; in a few days the gum will dissolve; the sirupy liquid is filtered. Carmine and hæmatoxylin stained objects can be mounted in this medium.

16. Gum and acetate of potash or of ammonia: Gum arabic, acetate of potash or of ammonia, glycerine, water. Made as the preceding medium, only a solution of potassic or ammonic acetate is used instead of a solution of chloral. Aniline stained objects can be mounted in this.

17. Iodized serum, artificial (Ranvier): 1. distilled water, 135 grm.; 2. egg albumen, 15 grm.; 3. common salt, 0·2 grm.; 4. tincture of iodine, 3 grm. Mix, 1, 2, 3 and filter; add 4 and filter again. Used for examinations, not for mounting.

18. Potassio-mercuric iodide (Stephenson): Biniodide of mercury, iodide of potassium water. To the water add an excess of each salt and filter. This gives a very dense liquid of high refractive index (3·02). For diatoms, etc., may be used diluted.

19. Monobromide of naphthalin. High refractive index; for diatoms, etc.

20. Monobromide balsam: Solution of hardened Canada balsam in monobromide of naphthalin. Refractive index high, 1·6; shows finer structure of diatoms, etc.

21. Monobromide tolu: Weir's medium; solution of balsam tolu in monobromide of naphthalin. Refractive index 1·73; may prove very valuable as a medium for diatoms. Preparation, dissolve 3 oz. of balsam tolu in 4 fluid drm. of benzol, add 4 fluid oz. carbon disulphide; shake well; let separate into layers; pour off carbon disulphide; renew this treatment with more carbon disulphide; pour it off again; evaporate the benzol from the balsam tolu. The tolu will now be free from cinnamic acid; put 1 fl. drm. of monobromide of naphthalin in ½ oz. vial, add enough of the purified tolu to make a stiff mixture or solution when cold. Heat to 104° or 122° F. when using.

22. Pacini's solution: Sodium chloride, 1 part; corrosive sublimate, 2 parts; water, 113 parts; glycerine, 13 parts. Let it stand three months, then use 1 part with 3 of water; filter before using. Recommended as a preservative of delicate tissues.

23. Phosphorus (Stephenson): Concentrated solution in carbon disulphide. High refractive index; difficult and dangerous to use; takes fire spontaneously in the air.

24. Ripart's solution: Camphor water, 75 parts; distilled water, 75 parts; glacial acetic acid, 1 part; copper acetate, 0·3 part; copper chloride, 0·3 part. Useful for delicate vegetable tissues, desmids, confervæ, etc.

25. Styrax: Chloroform solution. For diatoms; high refractive index.

26. American styrax: Chloroform solution filtered and hardened. Color as light as that of good balsam; high refractive index; for diatoms and fine tissues.

27. Harting's corrosive sublimate solution: Corrosive sublimate, 1 part; water, 200 to 500 parts. For blood corpuscles, etc.

28. William's solution: Saltpeter, 2 oz.; sal ammoniac, 2 drm.; corrosive sublimate, 1 dr.; glycerine, 2 oz.; alcohol, 1 pt.; water ½ qt. Let stand for several days; filter. More properly a preservative for large anatomical and other specimens.

29. Wickersheim's solution: Alum, 100 grm., saltpeter, 12 grm.; potash, 60 grm.; arsenious oxide, 20 grm.; boiled water, 3,000 grm. A preservative of large anatomical and other specimens.

30. Virodtzeff's solution: Glycerine, 2,160 parts; water, 1,080 parts; alcohol, 45 parts; thymol, 5 parts. A preservative of large anatomical and other specimens.—*The Microscope.*

Miscellaneous Formulas.—Gum and Sirup Congelation Mass for Imbedding (Cole, *Methods of Microscopical Research*, 1884; *Journ. Roy. Mic. Soc.*, 1884).—Gum mucilage (B. P.), 5 parts; sirup, 3 parts. (For brain, retinæ, and all tissues liable to come in pieces, put 4 parts sirup to 5 parts gum.) Add 5 grn. pure carbolic acid to each oz. of the medium.

Gum mucilage (B. P.) is made by dissolving 4 oz. picked gum acacia in 6 oz. water.

The sirup is made by dissolving 1 lb. loaf sugar in 1 pt. water and boiling.

This medium is employed for soaking tissues previous to freezing. They may remain in it for any length of time; all the year round if desired.

The freezing is conducted as follows: The gum and sirup are removed from the outside of the object by means of a cloth; the spray is set going and a little gum mucilage painted on the freezing plate; the object is placed on this and surrounded with gum mucilage; it is thus saturated with gum and sirup, but surrounded when being frozen with mucilage only. This combination prevents the sections from curling up on the one hand or splintering from being too hard frozen on the other. The mass ought to cut like cheese. Should freezing have been carried too far, wait for a few seconds.

Fol's Gelatin (Fol *Lehrb.*, p. 132).—Four grm. gelatin are dissolved in 20 c. c. glacial acetic acid by heating on a water bath and agitation. To 5 c. c. of the solution add 70 c. c. of 70% alcohol, and 1 to 2 c.c. 5% aqueous solution of chrome alum. Pour the mixture on the slide and allow it to dry. In a few hours the gelatin passes into the insoluble state. It retains, however, the property of swelling and becoming somewhat sticky in presence of water. The slide may then be immersed in water containing the sections. These can be slid into their places, and the whole lifted out; the sections will be found to be fixed in their places.

This method is especially useful for sections made under water, large celloidin sections among others.

1. Thwaites Fluid.—Water, 16 oz.; alcohol, 1 oz.; creosote, sufficient to saturate alcohol; chalk, q. s. Mix the creosote and alcohol, stir in the chalk, and add the water. Next add an equal proportion of water saturated with camphor.

2. Naphtha and Creosote.—Creosote, 3 drm.; wood naphtha, 6 oz; distilled water, 64 oz.; chalk, q. s. Mix the naphtha and creosote, then enough chalk to form a smooth paste; then add small quantity of water, and 2 or 3 lumps of camphor. Keep in covered vessel for two or three weeks; filter.

3. Solution of (C. P.) carbolic acid in water.

4. Solution of chromic acid.

5. Gelatine, 1 oz.; honey, 4 oz.; alcohol, ½ oz.; creosote, 6 drops. Soak the gelatine; then add the honey, which is heated to boiling; when almost cold add the creosote dissolved in alcohol; filter.

6. Burnet's solution is made of chloride of zinc; and is not recommended.

7. Calcium Chloride.—Saturated aqueous solution of calcium chloride (C. P.); recommended for hard structures.

8. Alum, also common salt.

9 Arsenious acid.

10. Spicer's Fluid.—Alcohol, 3 oz.; distilled water, 2 oz.; glycerine, 1 oz.

11. Camphor Water.—Distilled water, 1 qt.; tincture of camphor, 1 drm. Use only the clear fluid.

12. Rolf's Liquid.—Bay salt, 1 grn.; alum, 1 grn.; distilled water, 1 oz.

Passini's Solution.—For blood globules, nerves, and white tissues generally. Perchloride of mercury, 1 part; sodium chloride, 2 parts; glycerine, 13 parts; distilled water, 113 parts.

Brunswick Black.—Solution of asphalt in turpentine. Great diversity of proportion of the ingredients; the following is the best: ¼ lb. best asphaltum; 4¼ oz. linseed oil, which has been previously boiled, with ½ oz.; add litharge until it becomes stringy; then mix with ½ pt. oil of turpentine.

Cleaning Slides.—If spoiled in mounting, use a saturated solution of borax in water, in which soak the slides for a few days, then rinse in clean water. Borax is a solvent for balsam, shellac and other cements used in mounting, and does not act on the glass like soda, which is often recommended for this purpose.

To Rectify Turpentine for Microscopical Use.—In a quart bottle agitate 1 pt. of common turpentine with 4 fl. oz. of 98 % alcohol. Decant the turpentine, which will form the lower layer, after standing for two hours, and mix it with 1 pt. of clear water. Agitate and let stand until the two fluids separate. Decant the turpentine, which this time will form the upper layer, and finally, mix it with an oz. of powdered starch, and filter through paper. A pure, limpid turpentine is the result.

Staining Fluids.—1. Beale's Carmine.—Carmine, 10 grm.; ammonia, strong, ½ drm.; glycerine, 2 oz.; distilled water, 2 oz.; alcohol, ½ oz. Dissolve carmine in ammonia; boil for a few seconds in test tube; cool, then add the glycerine water, etc. Filter.

2. Thiersch's Carmine Fluid.—A. Carmine, 1 part; caustic ammonia, 1 part; distilled water, 3 parts. Filter. B. Oxalic acid, 1 part; water, 22 parts. (One part A is mixed with 8 parts B and 12 parts absolute alcohol are added.)

3. Thiersch's Lilac Fluid.—Borax, 4 parts; water, 56 parts; dissolve and add 1 part carmine. Mix with twice its volume of absolute alcohol; filter. The precipitate of carmine and borax is redissolved in water.

The Methods of Staining.—Coloring matters possessing so great an affinity for certain elements of tissues that they may be left to produce the desired electivity of stain without any special manipulation on the part of the operator, are unfortunately rare. In practice selective staining is arrived at in two ways. In the one, which may be called the direct method, you make use of a coloring reagent that stains the element desired to be selected more quickly than the elements you wish to have unstained, and you stop the process and fix the color at the moment when the former are just sufficiently stained and the latter not affected to an injurious extent, or not affected at all, by the color. This is what happens—for instance, when you stain the nuclei of a preparation by treatment with very dilute hæmatoxylin, you get, at a certain moment, a fairly pure nuclear stain; but if you prolonged the treatment, the extra-nuclear elements would take up the color, and the selectivity of the stain would be lost. It may be noted of this method that it is in general the method of fast stains, *echte Farbung*, and that it renders great services in the coloring of specimens in toto—a procedure which is not possible with the chief stains of the other class (the anilins). It is the old method of carmine and hæmatoxylin staining.

The second, or indirect, method is the method of overstaining followed by partial decoloration. You begin by staining all the elements of your preparation indiscriminately, and you then wash out the color from all the elements, except those which you desire to

have stained, these retaining the color more obstinately than the others in virtue of a certain not yet satisfactorily explained affinity. This is what happens—for instance, when you stain a section of one deep red in all its elements with safranin, and then treating it for a few seconds with alcohol, extract the color from all but the chromatin and nucleoli of the nuclei. It is in this method that the coal tar colors find their chief employment. It is in general applicable only to sections, and not to staining objects in toto (the case of borax carmine is probably only a seeming exception to this statement). It is a method, however, of very wide applicability, and gives the most brilliant results that have hitherto been attained.

Anilin Colors Giving Indirect Nuclear Stains —Flemming's Method.*—Very few anilins give a precise nuclear stain by the direct method. Two of them—methyl green and Bismarck brown—are pre-eminently nuclear stains. Many of the others—for instance, safranin, gentian, and especially dahlia, may be made to give a nuclear stain with fresh tissues by combining them with acetic acid; but in ninety-nine cases out of a hundred are not so suitable for this kind of work as the two colors first named, which practically form a class apart.

Again, very few anilins give a pure plasmatic stain (one leaving nuclei unaffected). The majority give a diffuse stain, which in some few cases becomes by the application of the decoloration or indirect method the most precise and splendid stain as yet obtainable by any means.

The indirect staining method, or Flemming's method, will form the subject of the present chapter, and the remaining anilins will be treated of in the next chapter.

The following list shows the colors treated of in this section:

Colors Giving Indirect Nuclear Stains—Flemming's Method.—

Red.—Safranin, Magdala red (Naphthalin red), Fuchsin (Roseïn, Rubin, Magenta, Solferino, Corallin), Rocellin (Echtroth, Orseillin, Rubidin), Mauvein, Rogue fluorescent.

Brown and Yellow.—Bismarck brown, Orange, Tropæolin (Chrysaurein).

Green.—Anilin green, Solid green.

Blue.—Victoria.

Violet.—Gentian, Dahlia, Methyl violet.

a. Direct Nuclear Stains.—Methyl green, Bismarck brown (Vesuvin), Methyl violet.

b. Plasmatic Stains, Stains not Affecting Nuclei.—Bleu lumière, Bleu de Lyon, Indulin (Nigrosin), Quinoleïn (Cyanin).

c. Other Colors (Ground Stains and Specific Stains):

Red.—Saüfrefuchsin (Acid fuchsin), Congo, Benzo-purpurin, Delta purpurin, Biebricher Scharlach, Eosin, Bengal rose.

Orange and Yellow.—Picric acid, Metanil yellow, Saüfregelb, Echtgelb, Tropæolin O, Crocein, Gold orange.

Green.—Iodine green, Thiophen green, Anilin green, Picro-anilin green.

Blue.—Anilin blue, Parma blue, Methylen blue.

Violet.—Violet B.

Black.—Aniiin black (Nigranilin, Blue black, Noir Colin).

Victoria Blue (Victoriablau). (Lustgarten, *Med. Jahrb. k. Ges. d. Aerzte zu Wien*, 1886.)—Stain (specimens strongly fixed in "Flemming" some hours, lightly fixed specimens a few minutes) in saturated aqueous solution. Wash out in pure alcohol (about one minute, more or less). You may clear with clove oil, but you had perhaps better take cedar or bergamot oil, as clove oil washes out the color very freely

* The word "anilin" is here used in the popular sense, to include all coal tar colors.

Gentian Violet.—One of the most important of these stains. It may be used in aqueous solution or in alcoholic solution diluted with about one half of water (Flemming, *Zells., Kern. u. Zellth.*, 1882, p. 384), and the stain may be washed out with pure alcohol or (Flemming, *Zeit. f. wiss. Mik.*, 1, 1884, p. 350) with acidulated alcohol, as directed below for safranin.

Anilin Green.—Use precisely as directed for Victoria blue, *supra.* An extremely delicate and absolutely precise nuclear stain, nucleoli being peculiarly brilliantly stained by it.

Dahlia.—(Flemming, *Arch. f. mik. Anat.*, xix, 1881.) Stain in an aqueous solution, either neutral or acidified with acetic acid, and wash out with pure alcohol. The stain is paler in the nuclei than with gentian or safranin. The cytoplasmic granulations of certain cells are sharply stained.

Safranin.—One of the most important of these stains, on account of its great power, brilliancy, and superior permanence in balsam, and also on account of the divers degrees of electivity that it displays for the nuclei and other constituent elements of different tissues.

The great secret of staining with safranin is to get a good safranin.

Other Nuclear Stains by the Indirect Method.—The foregiong paragraphs nearly exhaust the list of colors giving good nuclear stains by the indirect process. Flemming (*Arch. f. mik. Anat.*, xix, 1881), mentions the following:

Magdala Red (Naphthalin Red, Rose de Naphthaline.)—Nearly if not quite as good a stain as any of the foregoing, and superior to all except safranin in respect of permanency. This and the following should, as far as is yet made out, be used in alcoholic solution diluted with about one half of water, and be washed out with pure alcohol, followed by clove oil.

Mauvein and Rouge Fluorescent are good stains, but color some nuclei more deeply than others in the same preparation.

Solid Green (perhaps the same as the anilin green discussed above) is very elective for nucleoli.

Fuchsin (meaning the basic fuchsins, a series of rosanilin salts having very similar reactions and found in commerce under the names of fuchsin, anilin red, rubin, rosein, magenta, solferino, corallin).—A good but somewhat weak stain, by the alcohol method. Good results are obtained by substitution in the following manner (Graser, *Deutsche Zeit. f. Chirurgie*, xxvii, 1888, *Zeit. f. wiss. Mik.* v, 3, 1888): You either employ the color as directed for methyl violet, or you stain for twelve to twenty-four hours in a dilute aqueous solution, wash out for a short time in alcohol, stain for a few minutes in aqueous solution of methylen blue, and dehydrate with alcohol. A double stain. Chromatin and nucleoli red; all the rest blue.

Orange, precise but weak.

Bismarck brown is not very satisfactory with chromic objects. With alcohol objects it gives a good chromatin stain, but cannot be thoroughly removed from cytoplasm by any means yet discovered.

To these may be added—

Methyl violet, perhaps best used according to the method of Resegotti given in the last section; and (according to Griesbach, *Arch. f. mik. Anat.*, xxii, p. 132).

Tropæolin OOO, No. 2 (orange ii; chrysaurein, B naphtholorange), a fine dark orange stain, and—

Rocellin (echtroth, orseillin No. 3, rubidin, la Rauvarienne), a cherry red stain.

Benzoazurin has been lately recommended by Martin (see *Zeit. f. wiss. Mik.*, vi, 2, 1889). Stain for an hour or so in dilute aqueous solution and wash out with HCl alcohol.

Direct Nuclear Stains.—Methyl Green.—This is the most common, in commerce, of the anilin greens. It appears to go by the synonyms of

Methylanilin green, Vert Lumière, Lichtgrün, Grünpulver. When first studied by Calberla, in 1874 (*Morphol. Jahrb.*, iii, 1887, p. 625), it went by the name of *Vert en cristaux.* It is commonly met with in commerce under the name of more costly greens, especially under that of iodine green. It is important not to confuse it with the latter, nor with aldehyde green (*Vert d'Eusèbe*), nor with the phenylated rosanilins, Paris green, and *Vert d'alcali* or *Véridine.*

The chief use of methyl green is as a nuclear stain for fresh or recently fixed tissues. For this purpose it should be used in the form of a strong aqueous solution containing a little acetic acid (about 1% in general). The solutions must always be acid. You may wash out with water (best acidulated) and mount in some acid aqueous medium containing a little of the methyl green in solution.

Bismarck Brown (*Manchester Brown, Phenylen Brown, Vesuvin, La Phénicienne*).—A fairly pure nuclear stain that will work either with fresh tissues or with such as have been hardened in chromic acid.

The color is not very easily soluble in water. You may boil it in water, and filter after a day or two (Weigert, in *Arch. f. mik. Anat.*, xv, 1878, p. 258). You may add a little acetic or osmic acid to the solution. Maysel dissolves the color in acetic acid (this solution does not give a permanent stain). Alcoholic solutions may also be used. Paul Mayer recommends a saturated solution in 70% alcohol; or Calberla's mixture, or dilute glycerine (say of 40% to 50%) may very advantageously be employed.

Methyl Violet (Methylanilin=anilin-violet=Paris violet=inchiostro di Leonardi).—The following process has been recommended by Orth (*Amer. Mon. Micr. Journ.*, i, 1880, p. 143; *Journ. Roy. Mic. Soc.*, N.S., i, 1881, p. 137). Sections are to be soaked in water, and then brought into the following solution:

Anilin violet	1 part.
Acetic acid	300 parts.

Mount, without washing out, but simply draining, in acetate of potash (acetate, 2 parts; water, 1 part).

The stain will probably fade within a year or two.

Bleu lumière is stated to be a plasma stain not affecting nuclei. I have not been able to make out whether it is identical with Parma blue, which is one of the numerous toluidin blues. If it is, Frey recommends a solution in water of 1 : 1000, in which tissues stain in a few minutes, and may be mounted either in glycerine or balsam. *Lichtblau* is possibly a synonym of this color. The principal use of such a color is for making double stains.

Iodine Green (*Hofmann's Grün*) (Griesbach, *Zool. Anz.*, No. 117, vol. v, 1882.)—Griesbach employs the following solution:

Crystallized iodine green	0·1 gr.
Distilled water	35·0 gr.

These proportions may be varied according to the desire of the operator, within limits indicated only by the observation that good results can only be obtained from deep hued solutions.

The objects are to be put into water for a few seconds before staining. They stain instantaneously in general. They are to be washed out in water, and brought into glycerine, or dehydrated in absolute alcohol and passed through oil of cloves or anise seed into balsam or dammar. The stain is not destroyed by immersion in alcohol for days. The preparations are apparently permanent in balsam.

Violet B (S. Mayer, *Sitzb. d. k. Akad. d. Wiss. Wien*, iii, Abth.).—Used in solutions of 1 grm. of the color to 300 grm. of 0·5% salt solution, and with fresh tissues that have not been treated with any reagent whatever; this color gives a stain so selective of the elements of the vascular system that favorable objects, such as serous membranes, appear as if injected. The preparations do not keep well; acetate of potash is the least unsatisfactory medium for mounting them in.

A. Aqueous Carmine Stains.—Ammonia Carmine (Beale, *How to Work, &c.*).—

Carmine	10 grn.
Liquor ammoniæ (fortissimus, B. P.)	½ drm.
Price's glycerine	2 oz.
Distilled water	2 oz.
Alcohol	½ oz.

The carmine, in small fragments, is to be dissolved in the ammonia with the aid of heat, Boil for a few seconds and let cool. Leave uncorked for at least an hour, or until the excess of ammonia has evaporated as tested by the smell. Then add the glycerine, water and alcohol, and filter, or allow to settle and decant. If after keeping for some months the carmine begins to percipitate, owing to the escape of ammonia, add one or two drops of liquor ammoniæ.

Hoyer's Neutral Carmine (*Biol. Centralb.*, ii, 1882). If the solution made by the process given supra be mixed with 4 to 6 times its volume of strong alcohol a scarlet red precipitate is formed. This is separated by filtration, washed and dried or made into a paste with alcohol in which some glycerine and chloral is dissolved. Both the powder and the paste can be kept several months unchanged; they dissolve easily in water, particularly the paste. The solution passes readily through the filter, while the ordinary carmine solution can only be filtered with difficulty; it also keeps a long time unchanged, especially with the addition of 1 to 2% of chloral, and it has a much more intense coloring power.

Ranvier's Picro Carmine or Picro Carminate of Ammonia.—The method of preparation employed in the Laboratory of Histology of the Collège de France, kindly communicated to myself and Henneguy for our *Traité des Meth. Techn.* by M. Vignal, one of the assistants there, is as follows:

Take—

Water	1,000 parts.
Picric acid	20 parts.
Carmine	10 parts.
Ammonia	50 parts.

Put them into a stoppered bottle and leave them for two or three months in a warm place. Then put them into a large crystallizing dish and let them putrefy. When the liquid has become reduced by evaporation to four-fifths of its original volume, remove the crystals that have formed at the bottom, dry them and dissolve them in a little warm water. Filter the solution and examine it with the microscope to see whether the carmine is really dissolved. If not, add water and ammonia, and let the solution putrefy again; evaporate and examine as before. When you have got your carmine combined evaporate the solution to dryness in a stove and reduce the picro carminate to powder.

For staining, dissolve 1 grm. of the powder in 100 grm. of water and add a crystal of thymol to prevent the development of mould.

Alum Carmine (Grenacher's formula, *Arch. mik. Anat.*, xvi, 1879).—An aqueous solution (of 1% to 5% strength, or any other strength that may be preferred) of common or ammonia alum, is boiled for ten or twenty minutes with ½% to 1% of powdered carmine. It is perhaps the safer plan to take the alum solution highly concentrated in the first instance, and after boiling the carmine in it, dilute to the desired strength. When cool filter.

This stain must be avoided in the case of calcareous structures that it is wished to preserve.

Alum Carmine with Osmic Acid (Zoltán von Roboz, in litt.)—To 50 or 60 grm. of water is added alum carmine until the mixture is of an

almost red rose color; about 10 drops of a $\frac{1}{150}$ solution of osmic acid are added. (The mixture should have an appreciable smell of osmic acid.) The objects to be stained remain in the mixture for about thirty-six hours in the dark. It is hardly necessary to wash them, as the stain is perfectly precise without that. It is important to perform the staining in a well-closed vessel, in order to prevent the evaporation of the osmium.

Delage's Osmium Carmine (*Arch. de Zool. Exp. et Gen.*, iv, sér. 2, 1886; *Zeit. f. wiss. Mik.*, iii, 2, 1886).—Ammonia carmine neutralized by evaporation over a water bath and combined with an equal volume of 1% osmic acid solution, then filtered under a bell glass. Stains and fixes at the same time. (The mixture, however, will not preserve its fixative properties for more than a few days.)

Hamann's Acid Carmine (*Intern. Mon. f. Anat. u. Hist.*, i, 5, 1884; *Zeit. f. wiss. Mik.*, ii, 1885).—Thirty gr. of carmine, 200 c. c. of strong ammonia and acetic acid to neutralization or slightly acid reaction. This may be used for staining, but it is far better to redissolve in a mixture of ammonia and acetic acid in the same proportions the precipitate that forms when the solution is allowed to stand for from two to four weeks. Treatment with HCl is not necessary.

Neutral Borax Carmine (Nikiforow, *Zeit. f. wiss. Mik.*, v, 3).—Boil together 3 parts of carmine, 5 parts of borax and 100 parts of water, adding enough ammonia to get the carmine to dissolve. Evaporate to less than half the original volume. Add dilute acetic acid until the cherry red color changes (if you should add too much acetic acid you must reneutralize with ammonia). Add a little carbolic acid to preserve the solution.

A direct nuclear stain, like that of alum carmine, but more powerful. Osmic and chromic objects take the stain well. Overstaining does not occur, so that objects may remain for days in the stain. Wash out with water.

The Use of Cochineal.—What is the use of cochineal? In the first place, it gives us the means of getting a direct nuclear stain by means of an alcoholic solution. For some purposes this stain is unrivaled. In the second place it gives us an aqueous stain that takes the place of alum carmine, with perhaps a greater richness of differentiation.

Alum Cochineal (Partsch, *Arch. f. mik. Anat.*, xiv, 1877).—Powdered cochineal is boiled for some time in a 5% solution of alum, the decoction filtered and a little salicylic acid added to preserve it from mould.

Alum Cochineal (Czokor. *Arch. f. mik. Anat.*, xviii, 1880).—Seven gr. cochineal and 7 gr. calcined alum are rubbed up together into powder in a mortar; add 700 gr. distilled water and boil down to 400 gr. When cool add sufficient carbolic acid to be perceptible by the smell and filter several times. The violet solution is ready for use and will keep for six months, after which time it must be filtered again and a fresh trace of carbolic acid added.

Delafeld's Hæmatoxylin.—To 400 c. c. of saturated solution of ammonia alum add 4 gr. of hæmatox. crist. dissolved in 25 c. c. of strong alcohol. Leave it exposed to the light and air in an unstoppered bottle for three or four days. Filter and add 100 c. c. of glycerin and 100 c. c. of methylic alcohol (CH^4O). Allow the solution to stand until the color is sufficiently dark, then filter and keep in a tightly stoppered bottle.

Glycerine Solutions.—Ehrlich's Acid Hæmatoxylin (*Zeit. f. wiss. Mik.*, 1886).—The ordinary (alum) hæmatoxylin staining solutions easily decompose, giving rise to a blue precipitate which is formed by the splitting up of the alum into free sulphuric acid and a basic lake forming compound of alumina. By adding to a solution an appropriate acid this decomposition may be prevented. The end may be attained by acetic acid. Take—

Water	100 c. c.
Absolute alcohol	100 c. c.
Glycerine	100 c. c.
Glacial acetic acid	10 c. c.
Hæmatoxylin	2 grm.
Alum in excess.	

Let the mixture ripen in the light until it acquires a dark red color. It will then keep, with a perfectly constant staining power, for years, if kept in a well stoppered bottle. Sections are stained in a few minutes. The stain is also very appropriate for staining in the mass, as overstaining does not occur.

In order to get a blue stain with this acid solution, the stained objects should be washed out with common drinking water, which is always slightly alkaline, and not with distilled water.

Purpurin.—Ranvier's *formula* (*Traité Technique*).—Two hundred grm. water and 1 grm. alum are boiled in a porcelain capsule; purpurin rubbed up in water is added, and the boiling continued. The purpurin being dissolved to saturation (this is insured by taking care to have an undissolved excess in the capsule), the solution is filtered hot into a flask containing 60 c. c. of alcohol (36° Cartier = 90%).

Metallic Stains—Silver Nitrate: The Solutions to be Employed (Ranvier).—The solutions generally employed by Ranvier vary in strength from 1·300 to 1·500. Thus 1·300 is used for the epiploön, pulmonary endothelium, cartilage, tendon, while a strength of 1·500 is employed for the study of the phrenic center, and for that of the epithelium of the intestine. For the impregnation of the endothelium of blood vessels (by injection), solutions of 1·500 to 1·800 are taken.

M. Duval (*Précis*) recommends solutions of 1, 2, or at most 3%.

V. Recklinghausen used, for the cornea, a strength of from 1—400 or 1—500 (*Die Lymphgefässe*, etc., Berlin, 1862).

Robinski (*Arch. de Physiol.*, 1869) used solutions varying between 0·1 and 0·2%, which he allowed to act for thirty seconds.

Reich (*Sitzb. d. wien. Acad.*, 1873, iii, Abth., April; *Zeit. f. wiss. Mik.*) takes solutions of from 1—600 to 1—400, for the study of the endothelium of vessels by injection.

Rouget (*Arch. de Physiol.*, 1873) employed solutions as weak as 1—750 or even 1—1,000, exposing the tissues to their action several times over, and washing them with water after each bath.

Gold Stains.—Thus Bastian modified Cohnheim's original method by employing a solution of gold chloride of a strength of 1,000 to 2,000, acidulated with HCl (1 drop to 75 c. c.), and performing the reduction in a mixture of equal parts of formic acid and water, kept warm; heat being an agent that furthers reduction.

Hénocque (*Arch. de l'Anat. et de la Physiol.*, 1870) impregnates in a 0·5 solution of gold chloride, washes in water for twelve to twenty-four hours, and reduces, with the aid of heat, in a nearly saturated solution of tartaric acid. The tartaric acid solution must be contained in a well-stoppered bottle. The best temperature for reduction is 40° to 50° C. Reduction is effected very rapidly, and sometimes in a quarter of an hour.

Perchloride of Iron.—This reagent, introduced by Polaillon (*Journ. de l'Anat.*, iii, 1866), sometimes gives most useful results, especially in the study of peripheral nerve ganglia, in which it stains the nervous tissue alone, the connective tissue remaining colorless. The method consists in impregnating in perchloride of iron, and reducing in tannic, gallic, or pyrogallic acid.

The Hoggans, who have done very good work with this reagent, proceed as follows (*Journ. Ruckett Club*, 1878; *Journ. Roy. Mic. Soc.* ii,

1879): The tissue (having been first fixed with silver nitrate, which is somewhat reduced by a short exposure to diffused light) is dehydrated in alcohol, and treated for a few minutes with 2% solution of perchloride of iron in spirit. It is then treated with a 2% solution of pyrogallic acid in spirit, and in a few minutes more, according to the depth of tint required, may be washed in water and mounted in glycerine.

Combination Stains.—Renaut's Hæmatoxylic Eosin (Fol's *Lehrbuch*).—Renaut has given from time to time several formulæ for this stain. This one, communicated to Fol by Renaut, is the latest:

Concentrated aqueous solution of potassic eosin (*éosine à la potasse*)	30 c. c.
Saturated solution of hæmatox. in alcohol (ought to have been kept some time and to have precipitated)	40 c. c.
Saturated solution of potash alum in glycerine (of a density of about 1·26)	130 c. c.

Mix, and let the mixture stand five or six weeks in a vessel covered with a sheet of paper pierced with holes until the alcohol is evaporated, then filter.

For staining, the solution may be used as it is or diluted.

Methyl Green and Bismarck Brown.—(List, *Zeit. f. wiss. Mik.*, ii, 1885).—Stain for a few minutes in Weigert's Bismarck brown; wash, and stain in 0·5% aqueous solution of methyl green. Clear with bergamot oil or xylol, and mount in balsam.

Or, dilute the Bismarck brown for staining with 3 volumes of absolute alcohol, wash out with strong alcohol, and stain for a few minutes in the methyl green solution diluted with 3 volumes of absolute alcohol.

Or, stain for twenty-four hours in the Bismarck brown solution diluted with 50 volumes of water, and then for twenty-four hours in the methyl green solution diluted with 50 volumes of water.

Milks, Cosmetic. See **Cosmetics.**

Milk, to Test for Water.—A German chemist furnishes a very simple procedure for testing the amount of water in milk. All that is required is a small quantity of plaster of Paris, say, 1 oz. This is mixed with the milk to a stiff paste and then allowed to stand. With milk of 1,030 specific gravity and a temperature of 60° F., it will harden in ten hours; if 25% of water is present, in two hours; if 50%, in one hour and a half; and with 75%, in thirty minutes. Skimmed milk which has been standing for twenty-four hours, and is of 1,033 specific gravity, sets in four hours; with 50% of water in one hour; and with 75% in 30 minutes. Heat should not be applied, as then the use of the thermometer would be required. This test is certainly very simple and not costly.

Milk, to Keep from Souring.—A small quantity of boracic acid added to milk will keep it from souring and delay the separation of cream. It can be kept several days by this means.

Mill Picks, to Temper. See **Tempering.**

Minargent. See **Alloys.**

Mineral Waters. See **Waters.**

Minerals, Cement for. See **Cements.**

Minerals, Hardness of:

1. Talc. 2. Rock Salt	Scratched by finger nail.
3. Calcite 4. Fluor 5. Apatite 6. Orthoclase	Scratched by a knife blade.
7. Quartz 8. Topaz 9. Corundum 10. Diamond	May be roughly distinguished by a file.

Minofor. See **Alloys.**

Mint Cordial. See **Liquors.**

Mirbane, Essence of. Name for nitrobenzol.

Mirrors, Amalgam for. See **Amalgam.**

Mirrors, to Repair.—Remove the silvering from the glass around the scratch so that the clear space will be about a quarter of an inch wide. Thoroughly clean the clear space with a clean cloth and alcohol. Near the edge of a broken piece of looking glass mark out a piece of silvering a little larger than the clear space on the mirror to be repaired. Now place a very minute drop of mercury on the center of the patch and allow it to remain for a few minutes, clear away the silvering around the patch, and slide the latter from the glass. Place it over the clear spot on the mirror, and gently press it down with a tuft of cotton. This is a difficult operation, and we would advise a little practice before trying it on a large mirror.

Mirrors, to Silver. See **Silvering.**

Mites.—*To Clean Canary Birds of Mites.*—Put a clean white cloth over the cage at night. In the morning destroy the mites, which leave the bird, and will be found on the cloth. Take the cage apart and wash thoroughly.

Mixed Goods, to Dye. See **Dyeing.**

Mixture.—In pharmacy.—A compound liquid medicine, taken in divided doses. Mixtures are usually extemporaneous preparations, and in prescribing them, care should be taken not to bring together substances that decompose each other, nor to order heavy powders that speedily separate by subsidence.

Mocking Bird Food.—1. Hempseed, 3 parts; toasted wheat bread, 2 parts; maw seed, 1 part; ox heart, 1 part. Boil the ox heart well in water, cut it small, and place it in a pan in an oven, where it must be allowed to become perfectly dry and crisp. All the ingredients must then be thoroughly mixed and ground in a mill to coarse powder.

2. Mix together two parts corn meal, 2 parts pea meal, and 1 part moss meal; add a little melted lard, but not sufficient to make the mixture too greasy, and sweeten with molasses. Fry in frying pan for half an hour, stirring constantly, and taking care not to let it burn; this makes it keep well. Put it in a covered jar.

Modeling Clay.—Knead dry clay with glycerine instead of water, work thoroughly with the hands, moisten work at intervals of two or three days, keep covered with an old piece of rubber cloth to prevent evaporation of moisture.

Moiré Metallique. See **Tin.**

Molasses, to Clarify.—Common molasses may be clarified and rendered much more palatable by heating it over the fire and pouring in sweet milk in the proportion of one pint to a gallon of molasses. When the molasses boils up once, the albumen in the milk collects all the impurities in a thick scum upon the top, which must be carefully removed, and the molasses is then fit for use. Bullock's blood is also used for this purpose, but milk is more agreeable in many ways for domestic use.

Moles.—Croton oil, under the form of pommade or ointment and potassio-tartrate of antimony, under the form of paste or plaster, have each recently been successfully employed, on the Continent, for the removal of ordinary moles and nævi. The following is the mode of

using the latter adopted by an eminent French surgeon:

Tartar emetic, in impalpable powder	15 grn.
Soap plaster, emplastrum saponis	1 drm.

and beat them to a paste. Apply this paste to nearly a line in thickness (not more), and cover the whole with strips of gummed paper. In four or five days eruption or suppuration will set in, and, in a few days after, leave, in place of the nævus, only a very slight scar. Croton oil ointment effects the same, but less completely unless repeated, by producing a pustular eruption, which, however, does not permanently mark the skin.

The following courses of treatment are superior to that just given.

True nævi are often mistaken for these. A simple mole is a deposit of pigment in the substance of the skin. Treatment:

1. Calcium chloride	1 part.
Water	2 parts.

To be rubbed in nightly.

2. Bitter almond emulsion	1 oz.
Subnitrate of bismuth	1 oz.
Calcium chloride	½ oz.
Oatmeal water	2½ oz.

To be used every morning.

3. Prepared chalk	2 oz.
Carbonate of bismuth	2 oz.
Calcium chloride	½ oz.
Powdered borax	½ oz.
Carbonate of soda	½ oz.
Emulsion of bitter almonds	2 oz.
Milk	2 oz.
Glycerine	2 oz.
Starch	½ oz.
Oatmeal water	2 oz.
White wax	1 oz.
Cream	1 oz.
Cucumber juice	1 oz.
Emulsion of pistachio nuts	1 oz.

4. Mole Salve.—Diachylon plaster, 1 oz.; tartar emetic, 2 drm.; Croton oil, 10 drops. Spread a plaster just the size of the mole, and leave it on until it suppurates; remove and let it heal. It may leave a slight scar.

5. Corrosive sublimate, 5 grn.; muriatic acid, 30 drops; lump sugar, 1 oz.; alcohol, 2 oz.; rose water, 7 oz. Agitate together till all is dissolved. Apply night and morning.

Mordant.—A chemical preparation applied to fix the colors with which a textile has been dyed.

Mordants. See **Dyeing.**

Mortar.—A mortar that can hardly be picked to pieces is made as follows: Mix equal parts of lime and brown sugar with water, and be sure the lime is thoroughly air slaked. This mortar is equal to Portland cement, and is of extraordinary strength.

Mortar, Impenetrable.—To make impenetrable mortar, mix thoroughly ¼ of fresh unslaked lime with ¾ of sand; and let 5 laborers make mortar of these ingredients, by pouring on water with trowels, to supply one mason, who must, when the materials are sufficiently mixed, apply it instantly as cement or plaster, and it will become as hard as stone. The lime used should be stone lime; previous to its use it should be preserved from the access of air or wet, and the plaster screened for some time from the sun and wind.

Mortar, to Make.—1. Mortar is composed of quicklime and sand, reduced to a paste with water. The lime ought to be pure, completely free from carbonic acid, and in the state of a very fine powder; the sand should be free from clay, partly in the state of fine sand, and partly in the of gravel; the water should be pure; and if previously saturated with lime, so much the better. The best proportions are 3 parts of fine and 4 parts of coarse sand, 1 part of quicklime, recently slaked, and as little water as possible.

2. The addition of burnt bones improves mortar, by giving it tenacity and rendering it less apt to crack in drying; but they ought never to exceed ¼ of the lime employed.

3. When a little manganese is added to the mortar, it acquires the important property of hardening under water; so that it may be employed in constructing those edifices which are constantly exposed to the action of water. Limestone is often combined with manganese; in that case it becomes brown by calcination.

Khorassar or Turkish Mortar.—One part powdered brick and tiles; 2 parts fine sifted lime. Mix with water to the desired consistency, put on layers of 5 or 6 inches in thickness, between the courses of brick and stone. This mortar is used where great solidity is required in buildings.

Mortar, Waterproof.—Instead of slaking in the usual manner use a solution of copperas dissolved in warm water and use only fine quartz sand.

Mosaic Gold, to Make.—Bisulphide of tin, bronze powder, *aurum musivum.* ($Sn S_2$), known also as mosaic gold; it forms a beautiful yellow flaky compound, which is obtained by preparing an amalgam of 12 parts of tin and 6 parts of mercury; this is reduced to powder and mixed with 7 parts of sublimed sulphur and 6 parts of sal ammoniac. This mixture is introduced into a flask with a long neck, and is heated gently so long as any smell of sulphureted hydrogen is perceptible; the temperature is then raised to low redness, calomel and cinnabar are sublimed, and a scaly mass of $Sn S_2$ remains. If the heat be pushed too far, part of the sulphur is expelled and the operation fails; the sal ammoniac appears by its volatilization to moderate the heat produced during the sulphuration of the tin, which would otherwise rise so high as to decompose the bisulphide.

Moselle Wine. See **Wines.**

Mosquitoes.—1. To clear a room of mosquitoes, take a small piece of gum camphor in a tin vessel and evaporate it over a flame, taking care it does not ignite. A sponge dipped in camphorated spirits and made fast to the top of the bedstead will be found serviceable in the sleeping room. Decoction of pennyroyal, applied to the exposed parts, will effectually keep off these troublesome insects.—*American Pharmacist.*

2. A small amount of pennyroyal sprinkled around the room will drive away mosquitoes.

3. Burning a small quantity of Persian insect powder in a room is said to be efficient in driving away mosquitoes.

Mosquito and Gnat Bites.—Carbolate of lime, 10 grn.; water, 1 drm. It is said that a weak solution of carbolic acid—1 part in 50—used as a wash, will prevent their attacks.

To alleviate the unpleasant sensation caused by the bite of the mosquito, various remedies have been suggested. Among them are oil of cloves, ammonia, bicarbonate of soda, chloroform, thymol and ordinary soap. Doctors say, we have in our own experience obtained more relief from solution of cocaine, 4%, than from anything else.

Mosquito Oil:

Oil of tar	1 oz.
Olive oil	1 oz.
Oil of pennyroyal	½ oz.
Spirit of camphor	½ oz.
Glycerine	½ oz.
Carbolic acid	2 drm.

Mix. Shake well before using.

See also **Cosmetics** (*Lotions*).

Mosquito Tincture:

Eucalyptol	10 parts.
Acetic ether	5 parts.

Eau de cologne	40 parts.
Tincture of insect powder (1 to 5 S.V.R.)	50 parts.

Mix.

For sponging the skin a mixture of 1 part of this with 3 to 6 parts of water may be used. The tincture is also useful for spraying in apartments; for this purpose 1 part may be mixed with 10 parts water, and used in a spray producer.

Moths.—*Receipt for Destroying Moths.*—Take equal parts oil of camphor and spirits of turpentine. Soak blotting paper in the mixture. Let the paper dry, then lay among furs or clothing.

Moth Exterminators.—The *National Druggist* gives the following among other formulæ for moth exterminators:

1. Lupulin	1 drm.
Snuff	2 oz.
Camphor	1 oz.
Cedar Sawdust	4 oz.

Mix.

This is to be used for sprinkling where the moths frequent.

2. Carbolic acid, gum camphor, each	1 oz.
Benzine	1 pt.

Dissolve the gum and carbolic acid in the benzine.

Apply by saturating a piece of blotting paper, or use it in form of spray by use of an atomizer.

The following is recommended for sprinkling among furs, clothes, etc., to prevent the ravages of moths:

3. Patchouly herb	100 parts.
Valerian	50 parts.
Camphor	40 parts.
Orris, sumbul, each	50 parts.
Oil of patchouly, otto of roses, each	1 part.

The various ingredients are broken up as small as possible, passed through a wide sieve to separate the coarser pieces, and freed from dust by a fine sieve. The oils are mixed with the orris root, and all the ingredients are then combined.

4. Powdered cloves	50 parts.
Powdered black pepper	100 parts.
Powdered quassia	100 parts.
Sprinkle with—	
Oil of cassia, oil of bergamot, each	2 parts.
Camphor	5 parts.
Previously dissolved in—	
Ether	20 parts.
Then mix with—	
Carbonate of ammonium	20 parts.
Powdered orris	20 parts.

Moth Liquid:

5. Spirit of wine	500 parts.
Naphthaline	10 parts.
Carbolic acid	10 parts.
Camphor	5 parts.
Essence lemon	5 parts.
Oils of thyme, lavender and savine (of each)	2 parts.

This can be used by sprinkling over furs, clothes, carpets, furniture, etc., or, better still, by application by a spray producer.

Moth and Roach Exterminator.—1. Benzine is said to be more effective than anything else for exterminating moths, roaches, etc.

2. A little alum or borax solution in hot water injected into the cracks and applied by a cloth to the wood work in the vicinity of these hiding places is usually effectual.

3. Common salt is also very highly recommended.

Moths in Furniture.—1. There are two species of moths which infest furniture. One is a large fly of silvery white color; the worm of the same is shaped like a chestnut worm, and is familiarly known. It rarely infests furniture. The other is a small fly of a dark drab color; the worm is about one-fourth of an inch long, and tapering from the head to the tail. It was first observed by upholsterers about thirteen years ago. This fly penetrates a sofa or chair, generally between the back and seats of sofas, or under the seats, where the vacancy among the springs affords a safe retreat. It may make a lodgment in one week after the furniture is placed in the house. If such should be the case, in two months the worm will appear; and the continual process of procreation in a few months increases the number to thousands. This moth has no season. It destroys in winter and summer alike, and is kept in active life by the constant heat of the house. We find at the same time, in the same piece of furniture, the fly, the worm, and the eggs; thus showing that they are breeding and destroying all the time. It does not eat pure curled hair, but fastens its cocoon to it, the elasticity of which prevents its being disturbed. The inside of furniture is used by it only for the purposes of propagation. The worm when ready for food crawls out and destroys the covering, if of woolen or plush material, and falling to the carpet, destroys it. It rarely cuts through plush from the inside, as it is of cotton back, but there are instances where the worms have cut up muslin on the outside back of sofas. There is no protection against them but continual care. New furniture should be removed from the walls at least twice a week in the spring and summer, and should be well whisked all round, and particularly under the seats, to prevent the fly from lodging. This is an effectual preventive, and the only one known.

2. Cayenne pepper.

3. Scotch snuff.

4. Camphor.

5. Turpentine, and all other remedies for protection from the large moth are of little or no avail against the furniture moths.

6. Saturation with alcohol will not destroy them when in a piece of furniture. If the furniture is infested, they may be removed by taking off the muslin from under the seats and off the outside ends and backs, where they congregate most, and exposing to the air as much as possible. Beat well with a whisk or the open hand, and kill all the flies and worms which show themselves. This done often will disturb them, and may make them leave the furniture, in their desire to be left in quiet. When the furniture is free from moths and is to be left during the summer months without attention, it may be protected by camphor in small bags or highly concentrated patchouly. The safest way is to have the furniture well whisked twice a week.

7. If the moths attack the carpet, spread a wet sheet on the carpet, and run a hot flat iron over it quickly; the steam will effectually destroy both worms and eggs.

Moths, a Pleasant Perfume and Preventive against.—Take of cloves, caraway seeds, nutmeg, mace, cinnamon and Tonquin beans, of each 1 oz.; then add as much Florentine orris root as will equal the other ingredients put together; grind the whole well to powder, and then put it in little bags among your clothes, etc. Almost anything aromatic will keep off moths. The common bog myrtle which grows so freely in swampy places, is an excellent antidote. A piece of linen, moistened with turpentine and put into the wardrobe or drawers for a single day, two or three times a year, is also a sufficient preservative against moths.

Moth Powders. See **Powders.**

Moths, to Keep from Sleigh Robes.—Alcohol, 1 pt.; camphor, ½ oz.; dissolve. Spray with this liquid before storing.

Moulds. — *Mould for Alloys.*—Plaster of Paris mixed with equal parts of powdered pumice stone makes a fine mould for casting fusible metals. The same mixture is useful for incasing articles to be soldered or brazed. Casts of plaster of Paris may be made to imitate fine bronzes by giving them two or three coats of shellac varnish, and when dry applying a coat of mastic varnish and dusting on fine bronze powder when the mastic varnish becomes sticky.

Mould for Statuary.—The flexible moulds referred to are prepared as follows: Glue, 8 lb.; molasses (New Orleans), 7 lb. Soak the glue overnight in a small quantity of cold water, then melt it by heat over a salt water bath, stir until froth begins to rise, then add and stir in briskly the molasses, previously heated. Continue to heat and stir the mixture for about half an hour; then pour.

Moulding Wax. See **Waxes.**

Blackening for Moulds.—Charcoal powder or, in some instances, fine coal dust.

Moulds, Gelatine.—1. Allow 12 oz. of gelatine to soak for a few hours in water until it has absorbed as much as it can, then apply heat, by which it will liquefy. If the mould is required to be elastic, add 3 oz. of molasses and mix well with the gelatine. If a little chrome alum (precise proportions are immaterial) be added to the gelatine, it causes it to lose its property of being again dissolved in water. A saturated solution of bichromate of potash brushed over the surface of the mould, allowed to become dry and afterward exposed to sunlight for a few minutes, renders the surface so hard as to be unaffected by moisture.

2. Take the very best glue you can get, place it in plenty of cold water at night, the next morning take it out; you will find it swollen; the water it has absorbed during the night is sufficient to melt it by heat; mix then as much thick glycerine with it as you had glue, and keep the vessel containing them in a steam or water bath till all the water is about evaporated, and till you have left as much in weight as the weight of the dry glue and the glycerine taken together amounted to. You will then have a compound of glue and glycerine which will never dry, and a mould made of it can be used over and over again.

3. A good gelatine mould may be made in the following manner: Soak the best white glue in cold water for 24 hours, then drain off all the water. Melt the soaked glue in a water-jacketed kettle, then pour the glue upon the object, the latter being incased in a lead or pasteboard box. Let it cool for 12 hours, then separate the cast from the object. If the object be a statuette, a thread should be attached to the back, and extended out of the mould at both ends, so that it may be used for cutting open the mould after it is cooled, to permit of taking out the statuette. A good material for a mould is made in the following way: Dissolve 20 parts of fine gelatine in 100 parts of hot water, and add ½ part of tannin and the same amount of rock candy. It is said that a mould made of gelatine or glue alone may be made more durable by pouring over it a solution of bichromate of potash in water, 1 part of bichromate to 10 parts of water, and afterward exposing it to sunlight. Most objects require oiling slightly before being covered with glue or gelatine.

Preparation of Paraffin Moulds for Plaster Casts.—Prepare the specimen or preparation, making it as clean as possible; place on oiled paper, in a position that will show it to advantage. Soft projections may be held in position with threads suspended from a frame or from a heavy cord stretched across the room. Paraffin melted in a water bath is painted over the preparation with a soft brush, the first layer being put on with single and quick strokes, that the rapid cooling of the paraffin may not cause the brush to adhere to the preparation, thus drawing the soft tissues out of place, until the mould is formed about ⅛ in. thick; all undercuts must be well filled. When the mould is hard it can be readily separated from the preparation, it is then well washed with cold water. Stir fine dental plaster into cold water to consistency of cream, pour into the mould and out again several times, so that there will be no air bubbles on the surface, then fill the mould and let it stand until hard. Place the whole in a vessel containing boiling water until the paraffin is all melted; wash with clean boiling water. When the cast is thoroughly dry it may be painted with oil colors by coating it first with shellac varnish. Casts of any part of the body may be made from a living subject if the parts are not too sensitive to bear the heat of the paraffin, which is about 150° F.—*Annals of Surgery.*

Mountants. See **Pastes.**

Mousset's Alloy. See **Alloys.**

Mouth Glue. See **Glues.**

Mouth Pastilles. See **Cachous.**

Mucilages. See also **Pastes** and **Cements.**

1. The best quality of mucilage in the market is made by dissolving clear glue in equal volumes of water and strong vinegar, and adding one-fourth of an equal volume of alcohol, and a small quantity of a solution of alum in water. The action of the vinegar is due to the acetic acid which it contains. This prevents the glue from gelatinizing by cooling; but the same result may be accomplished by adding a small quantity of nitric acid. Some of the preparations offered for sale are merely boiled starch or flour mixed with nitric acid to prevent the gelatinizing.

2. A strong aqueous solution of reasonably pure dextrin (British gum) forms a most adhesive and cheap mucilage. Alcohol, or rather diluted wine spirit, is usually employed as the solvent where the mucilage is to be used for gumming envelopes, postage stamps, etc., in order to facilitate the drying, and acetic acid is added to increase the mobility of the fluid. The strong aqueous solution is more adhesive than that prepared with alcohol, for the reason that it contains a greater proportion of the gum. To prepare this, add an excess of powdered dextrin to boiling water, stir for a moment or two, allow to cool and settle, and strain the liquid through a fine cloth. The addition of a little powdered sugar increases the glossiness of the dried gum, without interfering greatly with its adhesiveness. The sugar should be dissolved in the water before the dextrin is added.

3. Add British gum (dextrin) to a quantity of hot water until a sirupy liquid is obtained; then add a few drops of clove oil, and cool for use.

Casein Mucilage.—Take the curd of skim milk (carefully freed from cream or oil), wash it thoroughly, and dissolve it to saturation in a cold concentrated solution of borax. This mucilage keeps well, and as regards adhesive power far surpasses the mucilage of gum arabic.

Elastic Mucilage.—Glycerine, 4½ parts; soft soap, 4½ parts; dissolve 1½ parts salicylic acid in 30 parts alcohol. Shake thoroughly, and add to a mucilage made of 139½ parts gum arabic and about 270 parts water. This mucilage remains elastic when dried, and does not have a tendency to crack.

Glass, Mucilage to Adhere to.—1. A strong mucilage capable of fastening wood or porcelain and glass together is made of 8¾ oz. strong gum arabic solution, to which a solution of 30 grn. sulphate of aluminum dissolved in ¾ oz. water is added.

2. Put 1 or 2 drops of glycerine in a small bottle of mucilage. This will prevent the gum cracking or drying. Too much glycerine must not be added, as that would prevent the gum from hardening.

Mucilage of Gum Arabic.—1. To make a clear, almost odorless and permanent mucilage, Francke neutralizes the free acid present in the gum with lime water. Instead of water he uses a mixture 20% lime water and 80% distilled water.

2. Ordinary mucilage, made from gum arabic, does not fix paper to wood or pasteboard, or to metallic surfaces. These disadvantages are overcome by adding a solution of sulphate of aluminum, made up in ten times its quantity of water. Ten grn. aluminum sulphate are sufficient for 250 grn. mucilage. Prepared in this way it will not become mouldy. Again, according to Hirschberg, a few drops of strong sulphuric acid are added to the gum solution, and the precipitated sulphate of lime allowed to settle. Solutions prepared in this way a year and a half ago have neither become mouldy nor lost their adhesive power.

Gum, to Preserve.—1. Hirschberg adds a few drops of sulphuric acid, whereby the lime contained in the gum is precipitated as sulphate; after standing, the mucilage is strained off, and exhibits no tendency to mouldiness, even after standing for eighteen months.—*Les Mondes.*

2. Moisten the gum with alcohol, then dissolve in water and add a few drops of sulphuric acid. After the deposition of the precipitated calcic sulphate, a perfectly colorless solution of gum is obtained, even when inferior kinds of gum are used.

3. To preserve gum solutions, a few drops of oil of cloves, alcohol or acid will preserve a quart of the mucilage of gum arabic of gum tragacanth from turning sour. A small quantity of dissolved alum will preserve flour paste.

Labels, Mucilage for.—1. The following is highly recommended by Dr. Carpenter: Dissolve 2 oz. gum arabic in 2 oz. water, then add ¼ oz. soaked gelatine (heat required), 30 drops of glycerine, and a lump of camphor. See also **Cements** and **Pastes.**

2. A good mucilage for labels is made by macerating 5 parts of good glue in 18 to 20 parts water for a day, and to the liquid add 9 parts rock candy and 3 parts gum arabic. The mixture can be brushed upon paper while still lukewarm.

3. Dextrine	2 parts.
Acetic acid	1 part.
Water	5 parts.
Alcohol	1 part.
Or 4. Gelatine	2 parts.
Rock candy	1 part.
Water	3 parts.

Mucilage, Linseed.—Linseed, 1 oz.; warm water, 6 oz. Digest for six hours, stir and then strain.

Paper, to Make it Adhere to Metals.—M. Eliel gives the following formula for a mixture which can be used for metal, glass or wood: Gum tragacanth, 30 grms; acacia gum, 120 grm.; water, 500 c. c. Dissolve, filter and add 2½ grm. of thymol suspended in 120 c. c. of glycerine; then add enough water to make up the bulk to 1 liter. This bath will keep a long time.—*Revue Photographique.*

Pocket Mucilage.—Boil 1 lb. of the best white glue and strain very clear; boil also 4 oz. of isinglass and mix the two together; place them on a water bath with half a pound of white sugar, and evaporate till the liquid is quite thick, when it is to be poured into moulds, cut and dried to carry in the pocket. This mucilage immediately dissolves in water and fastens paper very firmly.

Postage Stamp Mucilage.—Gum dextrin, 2 parts; water, 5 parts; acetic acid, 1 part. Dissolve by aid of heat and add 1 part of 90% alcohol.

Stick Mucilage.—Dissolve gum arabic in hot water to form a sirupy liquid, add a little clove oil and thicken with powdered gum dextrin; mould and dry slowly.

Tragacanth Mucilage.—Take of powdered tragacanth, 1 drm.; glycerine, 6 drm.; water, enough to make in all 10 oz. Rub the tragacanth in a mortar with the glycerine and then add the water. This will produce a mucilage at once of excellent quality.

Mum.—A beverage prepared from wheat malt, in a similar way to ordinary beer from barley malt. A little oat and bean meal is frequently added. It was formerly much drunk in England, but its use at the present day is chiefly confined to Germany, and to Brunswick more particularly.

Muntz Metal. See **Alloys.**

Murexide (Purpurate of Ammonia).—A splendid coloring matter, which, when pure, forms crystals of a golden green color by reflected light, but of a garnet red by transmitted light. It yields a reddish brown powder, which takes a golden green luster if rubbed with a hard, smooth body. It is insoluble in alcohol and ether, but dissolves readily in boiling water. Its source is the uric acid obtained in greatest purity from the excrements of serpents, but more abundantly from Peruvian guano.

Muriate.—Old name for substances containing chlorine, the name coming from muriatic acid; thus ammonium chloride was muriate of ammonia.

Musical Instruments, to Keep Moist.—Rub a little pure glycerine on the wood occasionally and then wipe it dry with a soft cloth.

Musk.—An odorous substance obtained from the musk deer (*Moschus moschiferus*), an animal inhabiting the mountains of eastern Asia. It is imported from China, Bengal and Russia. The Tonquin musk is most esteemed. See **Perfumery.**

Must.—The expressed juice of grapes before fermentation.

Mustard.—Soyer's is described as follows: Steep mustard seed in twice its bulk of distilled vinegar for eight days, grind to a paste and put it into pots, thrusting a red hot poker into each. Moutarde a l'Estragon: Gently dry 1 lb. black mustard seed, then powder it fine and mix it with 2 oz. salt and sufficient tarragon vinegar to make a paste. In a similar way are prepared several other mustards, by employing vinegars flavored with the respective substances, or walnut or mushroom catsup or the liquor of the richer pickles in proportions to suit. Suitable mortars or grinding apparatus can be procured through any jobber in hardware utensils or druggists' sundries, provided only the smallest articles are desired, otherwise they will have to be made specially.

Mustard, French.—1. Take salt, 1¼ lb.; scraped horse radish, 1 lb.; garlic, 2 cloves, boiling vinegar, 2 gal. Macerate in a covered vessel for twenty-four hours, strain and add sufficient flour of mustard.

2. The following is M. Lenormand's recipe: Flour of mustard, 2 lb.; fresh parsley, chervil, celery and tarragon, of each ½ oz.; garlic, 1 clove (or head); 12 salt anchovies (all well chopped); grind well together, add salt, 1 oz.; grape juice or sugar to sweeten, and sufficient water to form the mass into a thin paste by trituration in a mortar. When put into pots a red hot iron is momentarily thrust into the contents of each, and a little wine vinegar added.

Soyer's Table Mustard.—Steep 1 pt. mustard seed in 1 qt. of distilled vinegar for eight days. Grind into paste and put in pots, thrusting a red hot poker into each.

Mustiness in Casks.—Burn a little sulphur in the empty casks, bung, and let them stand for a day.

Myrrh.—A gum resin much used in medicine and in dentistry.

Nails, *Ingrowing.*—The whole nail should be scraped or filed thin, all irregularities being removed. Then the extremities should be raised and cut off beyond the part to which it is attached by growth. If the extremity of the finger be thickened and horny it should be rubbed down with moistened pumice stone. The future of the nail will now depend on the attention that is paid to it. After the operation the fingers should be covered with a stall for some weeks, but the latter may be removed every day for the purpose of bathing, etc. So soon as the distal extremity of the nail is seen to be growing it should be gently raised and the flesh of the finger pushed down, so as to remove any impediment to the forward growth of the nail. If this be repeated daily, and the part protected, the nail will eventually reach the extremity of the fingers. It had better be allowed to grow a little beyond this and then kept carefully cut.

Nails, Ingrowing.—1. Wear stockings that are at least ½ in. longer than the feet.

2. Wear broad toed shoes or boots that will allow the toes to rest without lateral pressure when standing. If possible, have the boots or shoes made over a last which has an elevation—a knob—where the great toe comes, so as to stretch the uppers up, thus preventing pressure on the nails.

3. Cease cutting the nail in any manner, but allow it to grow until it is from ½ in. to ¾ in. beyond the quick, bearing the soreness and pain that will come while growing to that length, with as much patience as possible, but on no consideration cutting any part of the nail. Putting cloth or cotton under it will usually add to the pain, because increasing the pressure.

4. Three or four times a week (every night is not too often), before retiring, soak the feet for half an hour in soap suds as hot as can readily be borne, and with a small blunt knife blade carefully remove from under and around the nail any dirt or matter that may have accumulated. Soaking the feet will do much toward removing the soreness. After the nail has grown to the required length, it may be trimmed as occasion requires, but always in such a manner as to leave the end of the nail about the shape of the end of the toe, with the corners at least ¼ in. beyond the flesh, until the cure is effected; and even then the nail should never be cut back of the end of the toe.

White Spots on Nail.—These are caused by opacity of the cells due to injury. Do not apply any chemicals, but rub the nail with pumice stone powder moistened. As the nail grows the spots will disappear.

Discolored Nails.—If caused by acids rub the nail with liquid ammonia; if by alkalies, use vinegar or lemon juice. Nitrate of silver stains may be removed by solutions of iodide of potassium or sulphydrate of ammonium; fruit and ink stains by oxalic or sulphuric acid in water, or salts of lemon (oxalate of potash). The hands should not, except when the last is used, be washed with soap for some hours after the application.

Cera Fortifant, for the Nails:

Oil of lentise	½	oz.
Salt	½	drm.
Resin	1	scruple.
Alum	1	scruple.
Wax	1	scruple.

Mix together:

Oil of bitter almonds	2	oz.
Oil of tartar	2	drm.
Essence of lemon	6	drops.

Put up in small vials, and let the label direct a frequent application when the nails are weak or loosened.

Polishing the Nails.—If the nails are stained, apply a little lemon juice. A little pumice stone in a very fine powder, or a little putty powder may be used to polish the nails. This is frequently colored with a decoction of cochineal. Apply with a piece of chamois skin.

Nail Powder. See **Powders.**

Nails, the, to Prevent from Splitting.—Keep the nails cut short; do not scrape or file them; moisten with a little glycerine.

Nails, to Whiten.—Sulphuric acid diluted, 3 drm.; tincture of myrrh, 1½ drm.; spring water, 6 oz. Cleanse the hands and apply the wash.

Nails, Memoranda Concerning.—This table will show at a glance the length of the various sizes, and the number of nails in a pound. They are rated from "3-penny" up to "20-penny." The first column gives the name, the second the length in inches, and the third the number per pound:

3-penny,	1 in. long,	557 per lb.
4-penny,	1¼ in. long,	353 per lb.
5-penny,	1¾ in. long,	232 per lb.
6-penny,	2 in. long,	167 per lb.
7-penny,	2¼ in. long,	141 per lb.
8-penny,	2½ in. long,	101 per lb.
10-penny,	2¾ in. long,	98 per lb.
12-penny,	3 in. long,	54 per lb.
20-penny,	3½ in. long,	34 per lb.
Spikes,	4 in. long,	16 per lb.
Spikes,	4½ in. long,	12 per lb.
Spikes,	5 in. long,	10 per lb.
Spikes,	6 in. long,	7 per lb.
Spikes,	7 in. long,	5 per lb.

From this table an estimate of quantity and suitable sizes for any job can be easily made.

The relative adhesion of nails in the same wood, driven transversely and longitudinally, is as 100 to 78, or about 4 to 3, in dry elm, and 2 to 3 in deal.

Naphtha Ether.—A mixture of benzole and alcohol or wood spirit forms a body which will burn without producing soot.

Naphtha or Rock Oil.—A combustible and very volatile liquid resembling turpentine It is found native and can be prepared artificially from the distillation of petroleum or coal tar. It has many uses and is a very valuable solvent.

Naphthaline.—One of the secondary products of the gas manufacture, or of the destructive distillation of coal. When pure it forms thin, white flakes of a pungent taste. It is insoluble in water, but dissolves readily in alcohol, ether, and in acetic and oxalic acids. It melts at 79° F., and has the sp. gr. 1·045. It is not readily inflammable and burns with a smoky flame.

Deodorization of Naphthalin.—Naphthalin has such a disagreeable odor that its use in medicine and surgery is considerably retarded thereby, and it has been found that the mixture of camphor and other deodorants with it is only of temporary benefit. But if the naphthalin be mixed with some benzoin and then sublimed, the sublimate of naphthalin is free from tarry odor and is pleasant to smell; moreover, it retains this pleasant odor, although this is not the case when the naphthalin is simply mixed with tincture of benzoin or benzoic acid.

Narcotic.—A medicine that produces drowsiness, sleep and stupor. In small doses, narcotics chiefly act as stimulants, but in large ones they produce calmness of mind, torpor, and even coma and death. Opium, henbane, hemlock, tobacco, camphor, alcohol, ether, etc., are narcotics.

Natural History Specimens, to Preserve. See **Anatomical Preparations.**

Nectar.—Lump sugar, 1 lb.; cold water, 1 pt.; madeira, 1 bottle. Grate in nutmeg and lemon peel.

Negatives. See **Photography.**

Negative Varnish. See **Varnishes.**

Negus.—A well known beverage, so named after its originator and patron, Colonel Negus. It is made of either port or sherry wine, mixed with about twice its bulk of hot water, sweetened with lump sugar, and flavored with a little lemon juice and grated nutmeg and a small fragment only of the yellow peel of the lemon. The addition of about 1 drop of essence of ambergris, or 8 to 10 drops of essence of vanilla distributed between a dozen glasses improves it.

Nergen. See **Alloys.**

Nessler's Solution.—Twenty-five grm. mercuric chloride are dissolved in 800 c. c. distilled water; 70 grm. potassium iodide are dissolved in 400 c. c. water, and the solutions are then mixed. 200 grm. potassium hydroxide. When it is dissolved and cooled enough water is added to make the whole 2 l. Now place in a dark closet, and before using add enough of a saturated solution of mercuric chloride until the red precipitate is dissolved; after filtering it is ready for use. It should now be of a light straw color.

Nets, to Protect. See **Cleansing** (*Mildew*).

Nets, to Waterproof. See **Waterproofing.**

Neutralization.—A term used to denote the reduction of an acid or alkaline solution to that state in which it exhibits no tendency either way.

Nickel Acetate, to Prepare.—Precipitate an aqueous solution of acetate of nickel with excess of a solution of carbonate of soda, settle, decant the liquid, wash the precipitate, and dissolve it in warm acetic acid. Concentrate by evaporation, and crystallize the salt—acetate of nickel.

Nickel, to Plate with. See **Electro-Metallurgy.**

Nickel Plate, Rust on. See **Rust.**

Niello, or Nielled Silver.—This process somewhat resembles enameling, and consists essentially in inlaying engraved metal surfaces with a black enamel. The composition is made as follows: Put into the first crucible, flowers of sulphur, 750 parts; sal ammoniac, 75 parts. Put into the second crucible, silver, 15 parts; copper, 40 parts; lead, 80 parts. When this mixture is sufficiently fused, the alloy thus formed is added to the fused sulphur in the first crucible, which converts the metals into sulphides. The compound is afterward removed from the crucible and reduced to a fine powder. To apply the powder, it is mixed with a small quantity of a solution of sal ammoniac. The entire surface of the engraved silver work is covered with the nielling composition; it is then placed in the muffle of an enameling furnace, where it is left until the composition melts, by which it becomes firmly attached to the metal. The nielling is then removed from the parts in relief, without touching the engraved surfaces, which then present a pleasing contrast in deep black to the white silver surfaces. This process is only applicable to engraved work.

Nitrate.—*Syn.* Nitras (Lat.).—A salt of nitric acid. The nitrates are very easily made by the direct solution of the base, or its oxide or carbonate in nitric acid, which in most cases should be previously diluted with water; by evaporation they may be obtained either in the pulverulent or crystalline state. The nitrates are characterized by deflagrating when thrown on red hot coal or when heated in contact with inflammable substances.

Niter.—The common name of potassium nitrate.

Niter, Chili.—A name for sodium nitrate.

Niter, Sweet Spirit of.—This is an alcoholic solution of nitrous ether. According to the U. S. Pharmacopœia, the mixture should have a sp. gr. of 0·837. It becomes acid by age.

Nitrites.—The salts of nitrous acid.

Nitrobenzol.—Nitrobenzol is formed by treating benzol with fuming nitric acid; after the violence of the reaction is over, the liquid is diluted with water, and the heavy oily fluid is collected, washed, and dried.

Nomenclature, Chemical. See also **Elements, Table of.**

Rules of Chemical Nomenclature.—1. Compounds of two elements, binary compounds, are named by placing the name of the positive atom first, then that of the negative, with its termination changed to *ide*.

2. Whenever the positive forms more than one compound with the same negative, numeral prefixes are applied to both constituents, the positive ending in *ic*, and the negative in *ide*.

3. Different compounds of the same two elements are also distinguished from each other by the termination *ous* and *ic* to the name of the positive element, *ic* indicating the higher combining power, and *ous* the lower. When there are more than two such compounds, the highest takes the prefix *Per*, and the lowest, *Hypo*.

The ternary compounds of chemistry are *Acids*, *Bases* and *Salts*.

1. Acids and salts are named like the binaries, from their constituents. The positive is placed first, and may have the same terminations as in the binaries.

2. The negative molecule which follows this takes its name from its characteristic atom, and ends in *ate* or *ite; ate* signifying more oxygen than *ite*.

3. Prefixes *Per* and *Hypo* are used same as in binaries.

4. Most acids are also named from the characteristic atom of the negative molecule. This name takes the terminations *ous* and *ic*, according to the relative amount of oxygen, and is followed by the word *acid*.

5. Bases are regarded as compounds of a positive radical with Hydroxyl (HO), and are called *hydrates*.

Chemists have found that all bodies, whether in the form of a solid, a liquid, or a gas, are either simple substances or can be resolved into simple substances, termed elements. These elements are represented by symbols, which are usually the initial letter or letters of their names. Different elements combine together in definite proportions forming an endless variety of substances, termed compounds.

Elements are classified into metals and non-metals, the former being distinguished by well marked properties, which are absent in the latter. The ultimate particles or atoms which compose any element differ in weight from the atoms of any other element, and the relative weight compared with hydrogen is termed the atomic weight.

Compounds are formed, as already stated, by the combination of different elements, thus: FeO represents oxide of iron, and MnO, oxide of manganese. In many cases two elements unite in more than one proportion, such as FeO, Fe_2O_3, Fe_3O_4, each of which requires a distinguishing name. There are several systems of nomenclature, but the simplest—for compounds containing two elements—is that of writing the name of the metal first, and the non-metal or least metallic element afterward, giving it the termination ide. When two non-metals combine, the one which is most unlike a metal is written second. Sometimes Greek prefixes are used for the element of the second position, such as *mono*, *di*, *tri*, *tetr*, etc., to indicate the number of atoms present.

Another system is to make the metal terminate in *ic* or *ous*. That compound which contains the greater proportion of the non-

metallic constituent is distinguished by the suffix *ic* and that containing the lesser in *ous*. The following list will illustrate these points:

Name.	Name.	Name.	Formula.
Iron oxide,	Ferrous oxide,	Iron protoxide,	FeO.
Iron trioxide,	Ferric oxide,	Iron sesquioxide,	Fe_2O_3.
Iron tetroxide,	Triferric tetroxide,	Black oxide of iron.	Fe_3O_4.
Manganese oxide,	Manganous oxide,	Manganese protoxide,	MnO.
Manganese dioxide,	Manganic oxide,	Manganese peroxide,	MnO_2.
Aluminum oxide,	Aluminic oxide,	Alumina,	Al_2O_3.
Calcium oxide,	Calcic oxide,	Lime,	CaO.
Magnesium oxide,	Magnesic oxide.	Magnesia,	MgO.
Titanium dioxide,	—	Titanic acid,	TiO_2.
Carbon monoxide,	Carbonic oxide,	—	CO.
Carbon dioxide,	—	Carbonic acid,	CO_2.
Silicon dioxide,	Silicic oxide,	Silica,	SiO_2.
Phosphorus pentoxide,	Phosphoric oxide,	Phosphoric acid,	P_2O_5.
Sulphur dioxide,	Sulphurous oxide,	Sulphurous acid,	SO_2.
Sulphur trioxide,	Sulphuric oxide,	Sulphuric acid,	SO_3.

When three elements—one being a metal and another oxygen—are combined together, the name of the second is made to end in *ate*. In the following list a few compounds are given to illustrate this, but it should be observed that the order of placing the symbols is immaterial. In works on metallurgy the arrangement of formulæ in the last column is most common.

Name.	Name.	Formulæ.
Iron silicate,	Ferrous silicate,	$FeSiO_3$ or $FeO.SiO_2$.
Iron silicate,	Ferrous silicate,	Fe_2SiO_4 or $2FeO.SiO_2$.
Iron sulphate,	Ferrous sulphate,	$FeSO_4$ or $FeO.SO_3$.
Calcium silicate,	Silicate of lime,	$CaSiO_3$ or $CaO.SiO_2$.
Aluminum silicate.	Silicate of alumina,	$Al_6Si_3O_{12}$ or $2Al_2O_3.3SiO_2$.
Calcium carbonate,	Carbonate of lime, limestone,	$CaCO_3$ or $CaO.CO_2$.
Iron carbonate,	Ferrous carbonate,	$FeCO_3$ or $FeO.CO_2$.

Nitro-Sulphuric Acid.—Term applied to a mixture of nitric and sulphuric acids, which is used in the preparation of gun cotton.

Noble Metals.—Gold, platinum, silver and a few other metals are called noble metals on account of their affinity for oxygen being so weak, for they can remain in fusion for many hours in contact with the air without becoming oxidized.

Nosegay. See **Perfumes.**

Novargent.—Dissolve recently precipitated chloride of silver in a solution of either sodium hyposulphite or potassium cyanide. Used chiefly to restore old plated goods. The liquid is rubbed over the metal to be coated with a little prepared chalk, and the part is afterward polished off with a piece of soft leather.

Noyau. See **Liquors.**

Oak, to Darken.—Oak s fumigated by liquid ammonia, strength 880°, which may be bought at any wholesale chemist's shop. The wood should be placed in a dark and airtight room, and half a pint or so of ammonia poured into a soup plate, and placed upon the ground in the center of the compartment. This done, shut the entrance, and secure any cracks, if any, by pasted slips of paper. Remember that the ammonia does not touch the oak, but the gas that comes from it acts in a wondrous manner upon the tannic acid in that wood, and browns it so deeply that a shaving or two may actually be taken off without removing the color. The depth of shade will entirely depend upon the quantity of ammonia used and the time the wood is exposed.

Ochers. See **Pigments.**

Odeurs, Odors.—In French perfumery the word "odeur," like parfum, often enters into the name of compound perfumes, particularly spirits, as in the following examples:

Odeur Délectable:

Oil of bergamot	½ drm.
Oil of cloves	½ drm.
Oil of lavender (English)	½ drm.
Oil of rose geranium	½ drm.
Essence of ambergris	10 drops.
Rectified spirit (strongest)	¾ pint.

Mix well; further add of—

Eau de rose	2½ oz.
Eau de fleurs d'oranges	2½ oz.

Oiled Clothing. 1. Dissolve 1 oz. of beeswax in 1 pt. of the best boiled linseed oil over a gentle fire, applying when cold with a piece of rag, rubbing it well in and afterward hanging up to dry, which will take four or five days.

2. Paint with boiled linseed oil colored to suit. It must be done in very hot room or in a bright sunlight. A shoebrush is the best for applying it. A little patent drier may be added. It is said that the Chinese use a mixture of 1 oz. each of beeswax and soft soap with the oil, which is then boiled down. If the surface seems tacky varnish with shellac varnish. In any case apply the oil as thin as possible and let it dry perfectly between successive coats.

Oil Cloths, to Clean. See **Cleansing.**

Oil Cloth.—Flexible Paint for Making.—Size with hot soap and alum solutions, used alternately, dry and enamel with colors ground fine in oil, with plenty of driers and a little turpentine. Finish with a thin copal varnish if high gloss is desired. Harden by drying at about 200° F.

Oil Cloths, Paint for. See **Paints.**

Oil Stains, to Remove. See **Cleansing.**

Oils. See also **Lubricants,** and the **Hair** *Oils.*

The oils are all arranged in alphabetical order and the following general descriptions of preparing oils will be found in their proper place: *Essential Oils, Perfumery Oils, Refining Oils, Rancid, to Prevent Oils Becoming, Restoration of Resinified Volatile Oil.*

Albertite Oil.—From albertite, a lustrous black mineral found in New Brunswick. A sample was shown in the Colonial Department of the International Exhibition of 1862. Odor very slight; illuminating power high; boiling point 338° F., or 126° above that of water.

Ambergris Oil.—Ambergris, 2 drm.; oil, 1 pt.; by infusion.

Bay Oil.—Laurel Oil; Expressed oil of bay.—By expression from either fresh or dried bay berries. It is limpid and insipid.

By decoction, Butter of Bay.—From the berries by boiling them in water and skimming off the oil. It is of a greenish color and buttery consistence. It is chiefly imported from Italy, and is a popular remedy for bruises, sprains, rheumatism and deafness. It is also used by veterinary surgeons.

Belmontine Oil.—From Rangoon tar or Burmese petroleum, by distillation; superheated steam being employed as the heating agent. Colorless, odor not unpleasant; specific gravity, 847, but although so heavy the oil is free from viscosity, and will rise rapidly in a comparatively long wick; inflaming point 134° F., open test; burns with an exceedingly white light, and posesses a very high illuminating power.

Ben Oil.—Behen Oil, Oleum Balatinum.—Obtained by simple expression from the seeds of various species of *Moringa*, trees resembling willows, indigenous to Arabia and Syria, but grown also in the West Indies. The oil is colorless and odorless, and possesses an agreeable flavor. By cooling, the more solid portions separate, and the parts remaining fluid, which are not apt to turn rancid, are much used for lubricating clocks and watches. Owing to the power of the oil for retaining odors, it is highly valued by perfumers, and is used in the preparation of macassar oil. It is also used in medicine, and sometimes as a salad oil. Its specific gravity varies from 0·912 to 0·915 at 60° F. (15·5° C.). It is said to be occasionally adulterated with olive oil.

Benzoin Oil.—Gum benzoin, 7 drm.; oil, 1 pt.; by infusion.

Pale Boiled Oil.—Linseed oil, 1½ qt.; powdered white vitriol (sulphate of zinc), 3 oz.; water, 1½ qt. Boil until the water has all evaporated. Settle and decant.

Bone Oil.—Animal Oil, Dippel's Oil, Oil of Hartshorn, Oleum Animale Empyreumaticum, Oleum Cornu Cervi, Oleum Dippelii.

This oil is obtained when bone black, or animal charcoal is made, by the ignition of bones in iron cylinders. After rectification it is known under the above names. The original Dippel's oil of pharmacy was produced from stag's horns, but all now met with in commerce is produced as above mentioned. It is fetid and dark colored and has a sp. gr. of 0·970. It is chiefly used to make lamp-black.

Oil of Bricks.—Sweet oil, 5 parts, brick dust, 1 part; distill.

Butterine.—Oleomargarine, Artificial Butter.—The manufacture of artificial butter has of recent years assumed great dimensions in America and on the continent. The following are the outlines of the process adopted in this industry in the United States:

Beef suet, carefully picked so as to remove objectionable pieces, is thoroughly washed in warm and afterward in cold water. Having been drained and broken up into small fragments, it is placed in a melting pan, either steam jacketed or with a steam coil inside, and heated to a temperature not exceeding 120° F. (49° C.). The fat is afterward drawn off, allowed to cool slowly, so as to permit the separation of stearin, down to the temperature of 70° F. (21° C.). At this temperature it is kept for twelve hours, or even longer, till a distinct granulation is noticed. The semi-solid fat is subjected to pressure between cloths; the solid portion, or stearin, is available for candle making, and the liquid portion, consisting of olein and margarine, or oleomargarine, is collected for use in the manufacture of butterine. The oil so obtained is about half the quantity of the fat originally taken. It is too limpid for use in this state, and accordingly is mixed with milk, etc., in the proportion usually of 20 lb. oleomargarine, 8 pints of milk, 6 pints of water, and a small quantity of annatto, carbonate of soda, and salt. This mixture, at a temperature of 70° F. (21° C.), is run upon ice, so as to suddenly cool it. It is then ready for packing. Some of the oleomargarine is sent to other localities in America or to Europe, either to add to genuine butter or to make butterine. It is stated that about 6,000,000 lb. of the oil are annually exported from New York.

Cacao Oil or Butter.—Butter of Cacao, Oleum Cacao Concretum, Butyrum Cacao.

From the seeds or nibs of Theobroma cacao or chocolate nuts, gently heated over a fire, then decorticated, and pressed between hot iron plates. The nibs are capable of yielding about 50 per cent. of fat. When pure it is white and has a pleasant odor, and it does not readily become rancid. It is soluble in boiling alcohol, from which it crystallizes on cooling. It fuses at about 86° F. (30° C.) Its specific gravity varies from 0·945 to 0·952. It is used in pharmacy as a basis for suppositories and pessaries.

Camphor Oil.—Liquid Camphor.—Obtained from incisions in the wood of the camphor tree of Borneo and Sumatra (*Dryabalanops aromatica*), in which it exists in cavities in the trunk; also by distillation from the branches of the *Camphora officinarum*, or laurel camphor tree. Colorless when rectified. Sixty lb. of the crude brown oil yield 40 lb. of pure white oil and 20 lb. of camphor. It rapidly oxidizes in the air. Used to scent soap.

Carbolized Oil.—Pure carbolic acid, 1 part; olive oil, 6 parts. Linseed oil is sometimes used as a vehicle, but olive oil is preferable, as being less prone to oxidation.

Cazeline Oil.—An excellent burning oil prepared from petroleum. Bright, limpid, with scarcely a trace of color; odor very slight, and quite free from any objectionable character; sp. gr., 0·805; lowest point of ignition, 144° F. (open test); burns with a pure white light; free from smoke and smell.

Oil (Coal), to Test.—Place a small sample of the oil to be tested in a cup partially immersed in a vessel of water, and having placed the bulb of a good thermometer in the oil, heat the water gradually, and as the temperature of the oil rises apply the flame of a burning taper to its surface, and note on the thermometer the degree at which it inflames. This should not occur below 120° F. Many of the standard oils inflame only at temperatures 150° F., or higher.

Cocoa Nut Oil.—*Syn.* Cocoa Nut Butter.—A species of vegetable butter from the common cocoa nut or cocoa palm. It is separated from the dried kernels by hydraulic pressure. Cocoa nut oil is frequently confounded with cocoa or cacao nut butter, which is the produce of a different plant.

The dried pulp of the cocoa nut is called copra or copperah, and hence the oil is sometimes called copra oil. As imported, the oil is of the consistence of butter, but has a lower melting point, fusing at about 73° to 80° F. (22·7° to 26·6° C.). When fresh, it has the sweet taste and agreeable odor of the cocoa nut, but has a great tendency to become rancid.

Cod Liver Oil.—The fish when landed are handed over to a fish room keeper, whose duty it is to split and open the fish and to deposit the livers in small tubs holding 17 or 18 gal. each. The tubs are soon afterward collected from the different fish rooms and conveyed to the manufactory. The livers are here thrown into tubs filled with clean cold water, and, after being well washed and jerked over, are placed on galvanized iron wire sieves to drain. They are next put into covered steam jacket

pans, and submitted to a gentle heat for about three-quarters of an hour, after which the steam is turned off, cold air again admitted, and the whole allowed to repose for a short time, during which the livers subside, and the oil separates and floats at the top. The oil is then skimmed off into tin vessels, and passed through flannel strainers into tubs, where it is left to settle for about twenty-four hours. From these the purer upper portion of the oil is run into a deep galvanized iron cistern, and again left to clarify itself by defecation for a few days. It is now further refined by carefully passing it through clean, stout moleskin filters, under pressure. The transparent filtered oil is received into a clean galvanized iron cistern, from which, by means of a pump, the casks are filled for exportation. The latter, before being filled, are seasoned and cleaned to prevent their imparting either flavor or color to the pure oil. By this process the the natural pale color of the oil is maintained and its medicinal virtues preserved intact.

To Disguise the Taste of Cod Liver Oil.—1. Four oz. essence of lemon, 2 oz. sulphuric ether, 1 oz. oil of caraway, 1 oz. oil of peppermint.

2. Many formulæ for this purpose have been given, and the *Boston Medical and Surgical Journal* adds the following:

Cod liver oil.....7 drm.
Spt. lavand. comp.....1 drm.
Brandy.....1 drm. Mix.

Colza Oil.—From the seeds of *Brassica campestris* (Linn.). It may be regarded as a superior sort of rape oil. Burns well in lamps, especially after being refined. Sp. gr. 0·9136. The term colza oil is commonly applied to ordinary refined rape.

Colzarine Oil.—A heavy hydrocarbon oil, adapted for burning in lamps. Limpid, quite inodorous; of a pale amber color; gravity about 0·838; temperature at which the vapor can be permanently ignited, 250° F. (open test). Compared with vegetable colza oil, its illuminating power is in the proportion of 3 to 2.

Cotton Seed Oil (Oleum Gossypii Seminum).—Prepared from the seeds separated from the lint or wool of *Gossypium barbadense*. The cleaned and decorticated seeds are pressed into cakes, which are subjected to heat, and again pressed so as to liberate the oil. The yield is from 12 to 20%. The specific gravity of the crude oil varies from 0·928 to 0·930, and of the refined oil from 0·920 to 0·923, and the congealing point from 45° F. to 32° F. The refined oil has a yellowish brown color, and a somewhat pleasant flavor. It possesses slight drying properties, but is sometimes classed among non-drying oils. It is used for lamps, paints and in soap making.

Castor Oil.—*Syn.* Ricini oleum (B. P.), Oleum castorei, O. ricini (Ph. L., E. and D.).—"The oil prepared by heat or by pressure from the seed of *Ricinus communis*, Linn." (Ph. L.), the *Palma christi*, or Mexican oil bush.

Cold drawn castor oil is the best quality, and the only one fit for medicinal use, except in veterinary practice. It is prepared by pressing the shelled and crushed fruit, or seed, in hempen bags in hydraulic presses. The oil, as it escapes, is received into well tinned vessels, in which it is afterward mixed with water and heated till the water boils, and the albumen and gum separate as a scum. This is carefully removed, and the oil, as soon as it has become cold, is filtered through Canton flannel and put into canisters. It is termed cold drawn, and is of a light straw color.

Commoner kinds of oil are prepared by gently heating the crushed seeds and pressing them while hot. Another method sometimes adopted is to put the crushed seed into loose bags, to boil these in water, and to skim off the floating oil. The oils prepared by combined roasting and boiling are darker in color than when cold drawn; they are also more viscid and soon become rancid. They are used for lamps in Indian bazars.

In the United States a somewhat different method of extraction is adopted. The cleansed seeds are heated in an iron tank, with care to avoid scorching. Pressure is then applied and first quality oil is drawn off. The pressed residue is again heated and squeezed, the product being second quality oil. A third quality oil is obtained after a repetition of the heating and pressure. Each of these three products has to be further purified by heating with water, as described above under cold drawn oil.

Oil, Croton.—From the shelled seeds of *Croton tiglium*, or molucca grains. Imported chiefly from the East Indies. It is one of the most powerful cathartics known, and acts when ether swallowed or merely placed in the mouth. Externally it is a rubefacient and counter-irritant, often causing painful pustules, like tartar emetic.

Oil of Eggs.—Made by gently heating the yelks of eggs until they coagulate and the moisture is evaporated; then press or break up, digest in boiling rectified spirits, filter the tincture while hot, and distill off the spirits. Bland; emollient. The common plan is to fry the yelks hard, but the oil is then darker colored and stronger. Formerly used to kill quicksilver, and still held in esteem for sore nipples and excoriations.

Colorless Drying Oil for Paint.—Heat 4 gal. of water to the boiling point; when about to boil add 4 gal. linseed oil and ¼ lb. of red lead. Keep boiling and stirring for two hours over a moderate fire. Take from the fire and allow it to settle. The oil will be clear and colorless.

Drying Oil.—Linseed oil boiled along with oxide of lead (litharge), by which it acquires the property of drying quickly when exposed in a thin stratum to the air. It is much used in the preparation of paints and varnishes.

Resinous Drying Oil.—Take 10 lb. of drying nut oil, if the paint is destined for external articles, or 10 lb. of drying linseed oil, if for internal articles; 3 lb. of resin and 6 oz. of turpentine. Cause the resin to dissolve in the oil by means of a gentle heat. When dissolved and incorporated with the oil, add the turpentine; leave the varnish at rest, by which means it will often deposit portions of resin and other impurities, and then preserve it in wide-mouthed bottles. It must be used fresh; when suffered to grow old it abandons some of its resin. If this resinous oil assumes too much consistence, dilute it with a little essence, if intended for articles sheltered from the sun, or with oil of poppies.

Cutting Essential Oils.—Triturate in a mortar 2 oz. of the oil with 4 oz. of powdered artificial pumice stone, and 4 oz. of powdered sugar, until all the oil is absorbed; 16 oz. of alcohol, 95° F. should then be added by degrees; stir briskly all the time; filter through filtering paper. Repeat the filtering until the essence is perfectly clear. The essence will be soluble in water.

Essential Oils, to Distill.—Chevallier gives the following rules for the distillation of essential oils:

1. Operate upon as large quantities as possible, in order to obtain a greater product, and one of finer quality.
2. Conduct the distillation rapidly.
3. Divide the substances minutely, in order to faciliate the extrication of the oil.
4. Employ only sufficient water to prevent the matter operated on from burning, and the product from being contaminated with empyreuma.
5. For substances whose oil is heavier than water, saturate, or nearly saturate, the water in the still with common salt, to raise the boiling point, and thus to enable the vapor to carry over more oil.
6. Employ, when possible, water which has been already distilled from off the same substances, and has thus become saturated with oil.

7. For oils naturally fluid, keep the water in the refrigerator cool; but for those oils which easily become solid, preserve it at 80° to 90° F.

To the above may be added:

8. Collect the oil as soon as possible after it separates from the water with which it passes over, and in its subsequent treatment keep it as much as possible from free contact with the air.

Dr. Ure remarks: "The narrower and taller the alembic is, within certain limits, the greater will be the proportion of oil, relative to that of the aromatic water, from like proportions of aqueous and vegetable matter employed. Some place the plants in baskets, and suspend these immediately over the bottom of the still, under the water, or above its surface in the steam; but the best mode, in my opinion, is to stuff an upright cylinder full of the plants and drive down through them steam of any desired force, its tension and its temperature being further regulated by the size of the outlet orifice leading to the condenser. The cylinder should be made of strong copper, tinned inside, and incased in the worst conducting species of wood, such as soft deal or sycamore."

The newly distilled oils may be separated from adhering water, which frequently renders them partially opaque or cloudy, by repose at a temperature between 60° and 70° F., and subsequent decantation; but to render them quite dry (anhydrous), it is necessary to let them stand over some fragments of fused chloride of calcium. This is not, however, required with the commercial oils.

I. Absorption or Enfleurage.—The ordors of some flowers, such as jessamine and mignonette, are too delicate to bear heat, and for these the process of absorption is employed. Sheets of glass in wooden frames, called chassis, are coated on their upper and lower surfaces with grease about a tenth of an inch in thickness. The flowers are spread upon this grease, and a number of frames are superimposed on each other. After a day or two the flowers are carefully removed, and replaced by fresh ones, and this is continued for two or three months till the fat is impregnated with the odors. It is then removed, and extracted with alcohol.

Recently the grease has been replaced in some cases by paraffine, glycerine, or vaseline.

II. Solvents.—For this process various solvents are used, such as alcohol, ether, chloroform, petroleum, bisulphide of carbon, etc., and the oil is extracted by these in a percolator.

III. Expression.—The essential oils of lemons and oranges of commerce, and of some other fruits, are chiefly obtained by submitting the yellow rind to powerful pressure, but in this way they are not so white, nor do they keep so well, as when distilled, although in the case of the fruits referred to the oils are more fragrant then when prepared by any other method.

This process is only adapted for substances which are very rich in essential oil.

IV. Maceration.—Flowers with very delicate perfume, such as those of the bitter orange, violets, etc., which would be spoiled by distillation, are treated by this method. The medium used for infusion is clarified beef or mutton suet, or lard. The fat is melted, the flowers immersed, and the mixture stirred occasionally for a day or so. The exhausted flowers are removed and fresh ones introduced, and such renewals are continued till it is judged that the fatis sufficiently charged with the oil.

V. Rectification.—This is commonly performed without water, by the careful application of a heat just sufficient to make the oils flow over pretty rapidly, so that they may be kept heated for as short a time as possible. One half, or at most two thirds only, is drawn off, that left in the retort being usually mixed with raw oil intended to be sold in that state. This method often leads to much loss and disappointment, and more than one rather dangerous explosion has been known to result from its use. A better plan is to rectify the oil from strong brine, and then to separate any adhering water, either by repose or chloride of calcium.

Volatile oils should be preserved in well closed and nearly full bottles, in the shade, and should be opened as seldom as possible. By age they darken, lose much of their odor, increase in density, and become thick and clammy. It is then necessary to distill them, by which the undecomposed portion is separated from the resin. Agitation along with animal charcoal will restore their clearness and original color, but nothing more.

Fusel Oil.—Grain oil, marc brandy oil, potato oil obtained in the manufacture of alcohol from grain, or potatoes, and especially observable in them marc brandy of the South of France. It is a mixture of various alcohols, of which the most prominent is amylic alcohol ($C_5H_{12}O$). If the portion which distills between 260° and 280° F. is collected apart and redistilled, an oil is obtained having a fixed boiling point of 268°–269° F. Thus purified, it is a thin, mobile liquid, with a suffocating odor and burning taste. When warmed, and dropped upon platinum black, it oxidizes to valeric acid, which bears the same relation to amylic alcohol that acetic acid does to ordinary alcohol.

Oil Hair. See **Hair.**

Lard Oil.—Lard is the fat of the pig melted by a gentle heat, and strained through flannel or a hair sieve. Good lard is white, and contains no water or other foreign matter, with the exception of a little salt, when not intended for medical purposes.

Lard oil is obtained when lard is subjected to great pressure in the cold. It consists chiefly of olein. It is said to be superior to olive oil for greasing wool, and, from its low price, is largely employed.

Oil of Lemon.—To Restore the Fragrance of Oil of Lemon.—There are several oils that by absorption of oxygen from the air will become camphorated, grow turbid, deposit a residue generally called stearopton, and lose more or less of their flavor, instead of which they acquire the odor of turpentine. Those oils that are free from oxygen are chiefly subject to these changes, and it is therefore necessary to keep them in full bottles, well stoppered and in a cool place. When they have deteriorated in the way indicated they may be improved, but can never be restored to their original quality. Many means have been proposed for this purpose, but the one now generally employed is to shake the oil with warm water several times, letting it settle and drawing it off by means of a siphon. It may lastly be filtered through paper or linen.

To Keep Oil of Lemon Fragrant.—To every pound of oil one ounce of alcohol is to be added, and well mixed; then one ounce of water is put with it, which again withdraws the alcohol from the oil, and collects at the bottom of the bottle as dilute alcohol, where it should be permitted to remain until the oil has been used, with perhaps an occasional shake up when the bottle has been opened. Oil of lemon treated in this manner has been kept fresh and fragrant for over a year. Oil of orange may be treated in the same manner with excellent effect.

Oil of Lemon.—To Restore the Fragrance of.—Put warm water with the oil and shake it well, then after it is settled draw it off, using a siphon, and filter it by means of a paper or linen.

Oil, Linseed.—A drying oil obtained by expressing the seeds of common flax, which yield from 20 to 25% of their weight. The drying quality of the oil is increased by boiling for three to six hours, and then stirring in sever or eignt-hundredths of its weight of litharge.

Linseed Oil.—Oleum Lini.—Commercially, this

oil is obtained from the seeds of *Linum usitatissimum*, as imported from Russia and India, which contain various properties of different cruciferous weed seeds. The oil has usually, therefore, an acrid taste derived from the presence of these impurities. There are three kinds of the oil, according to the method of preparation:

1. Cold Drawn.—Oleum Lini sine Igne.—The seeds are bruised or crushed, ground and expressed without heat. This is considered the best oil. It is pale, tasteless if pure, viscous, but does not keep as well as the next. By this process the seeds yield only from 17% to 22% of oil.

2. Ordinary Linseed Oil.—Prepared as the last, but with a steam heat of 200° F. It is amber colored or dark yellow, and is less viscous than the last. It solidifies about 2° to 4° F. It is soluble in 5 parts of boiling and 40 parts of cold alcohol. Produce 22% to 28%. Both these are drying and cathartic, and are extensively used in paints, printing inks, varnishes, etc.; in specific gravity they vary from 0·930 to 0·935.

3. Boiled Linseed Oil.—The resinifying or drying property of oils is greatly increased by boiling them, either alone, or along with some litharge, sugar of lead, or white vitriol, when the product forms the "boiled oil," or "drying oil" (oleum desiccativum) of commerce. The efficacy of the process depends on the elimination of substances which impede the oxidation of the oil. The following formulæ are adopted for this purpose:

a. Linseed oil, 1 gal.; powdered litharge, ¾ lb.; simmer with frequent stirring until a pellicle begins to form; remove the scum, and when it has become cold, and has settled, decant the clear portion. Dark colored; used by house painters.

b. Linseed oil and water, of each 1 qt.; white vitriol in powder, 2 oz.; boil to dryness. Paler than the last.

c. Pale linseed or nut oil, 1 pt.; litharge or dry sulphate of lead, in fine powder, 2 oz.; mix, agitate frequently for ten days, then set the bottle in the sun or a warm place to settle, and decant the clear portion.

d. Linseed oil, 100 gal.; calcined white vitriol (sulphate of zinc), in fine powder, 7 lb.; mix in a clean copper boiler, heat the whole to 285° F. and keep it at that temperature, with constant stirring, for at least one hour, then allow it to cool; in twenty-four hours decant the clear portion, and in three or four weeks more rack it for use. Used for varnishes.

e. Liebig.—Sugar of lead, 1 lb., is dissolved in rain water, ½ gal.; litharge in fine powder, 1 lb., is then added, and the mixture is gently simmered until only a whitish sediment remains; levigated litharge, 1 lb., is next diffused through linseed oil, 2½ gal., and the mixture is gradually added to the lead solution, previously diluted with an equal bulk of water; the whole is now stirred together for some hours, with heat, and is lastly left to clear itself by exposure in a warm place. The lead solution, which subsides from the oil, may be used again for the same purpose, by dissolving it in another pound of litharge as before.

f. Wilks.—Into linseed oil, 236 gal., pour sulphuric acid, 6 or 7 lb., and stir the two together for three hours; then add a mixture of fuller's earth, 6 lb., and hot lime, 14 lb., and again stir for three hours; next put the whole into a copper, with an equal quantity of water, and boil for about three hours; lastly withdraw the fire, and when the whole is cold, draw off the water, run the oil into any suitable vessel, and let it stand for a few weeks before using it. (Patent.)

There is often a difficulty in obtaining the oils "bright," after boiling or heating them with the lead solution. The best way, on a small scale, is either to filter them through coarse woolen filtering paper or to expose the bottle for some time in the sun, or in a warm place. In a large scale, the finer oils are often filtered through Canton flannel bags, sp. gr., from 0·940 to 0·950.

Menhaden Straits or Bank Oil is produced by subjecting to heat the *Alosa menhaden*, a kind of herring. After purification by boiling, filtration and pressure, it is available for soap making and tanning. It is sometimes used as a substitute for cod liver oil, and sometimes mixed with linseed oil for painters' use.

Mafurra Oil.—A kind of grease or fat, nearly approaching palm oil. It is extracted by means of hot water from the so-called Mafurra or Mafutra almonds. 65% of oil can be obtained from the husked seeds.

Musk Oil.—Grain musk, 1 drm.; ambergris, ½ drm.; oil of lavender, 20 drops; oil, 1 pt.; by infusion. A second quality is made by working the same ingredients, after the oil poured from them, with ¾ pt. fresh oil.

Musk and Ambergris Oil.—Huile Royal. Ambergris, 2 drm.; grand musk, ½ drm.; oils of cassia, lavender, neroli and nutmeg of each 10 drops; oil, 1 pt. by infusion.

Neatsfoot Oil.—This obtained from neat's feet (ox or cow heels) and tripe (preferably the first), by boiling them in water and skimming off the oil. For nice purposes the oil is so obtained is kept gently heated by means of warm water until the whole of the water has subsided from it, when the clear portion is poured off and if necessary filtered. It is extremely emollient and does not thicken by age. The pure oil is highly esteemed for chaps, excoriations, etc., and, when scented, to make the hair grow; the ordinary oil is chiefly used to fry fritters and to soften leather.

Olive Oil.—Salad oil, sweet oil, olivæ oleum. The oil expressed from the fruit of Olea Europæa, or common olive.

1. Virgin Oil.—Oleum virgineum, Huile vierge. From olives carefully garbled, either spontaneously or only by slight pressure in the cold. That yielded by the pericarp of the fruit is the finest.

2. Ordinary Fine Oil.—This is obtained by either pressing the olives, previously crushed and mixed with boiling water, or by pressing at a gentle heat, the olives from which the virgin oil has been obtained. The above processes furnish the finer salad oils of commerce. The cake which is left is called grignon.

3. Second Quality.—By allowing the bruised fruit to ferment before pressing it. Yellow, darker than the preceding, but mild and sweet tasting. Much used for the the table.

4. Gorgon.—By fermenting and boiling the pressed cake or marc in water and skimming off the oil. Inferior.

5. Oil of the Infernal Regions.—Oleum omphacinum. This is a very inferior quality of oil, which is skimmed off the water in the reservors into which the waste water which has been used in the above operations is received and allowed to settle. The last two are chiefly used for lamps and in soap making. Provence oil is the most esteemed. Florence oil and Lucca oil are of very fine quality. Genoa oil comes next, then Gallipoli oil; Sicily oil is inferior; Spanish oil is the worst imported.

Mixtures of olive oil with small amounts of cotton seed and sesamé oils are distinguished by the entire mass, though at first more darkly colored and solidifying like pure olive oil, yielding, after from twenty-four to thirty-six hours, a brown oil upon the surface of the firmly solidified mass, while the lower layer shows the yellow color of the pure olive oil. Oils which have been treated with alkalies show the same reactions as the pure oils.—

Olive Oil, to Test.—Bach's method of testing olive oil.

a. Nitric Acid Test.—5 c.c. of the sample are shaken in a convenient tube with 5 c.c. of nitric acid of sp. gr. 1·30 for one minute, and the re-

sulting color observed (*a*), after one minute, and (*b*) after standing five minutes in boiling water, and (*c*) the consistence noted after standing for twelve to eighteen hours at about 60° F. (15.5° C.).

	Color.		Consistence.
	One minute.	Five minutes.	
Pure olive oil.	Pale green.	Orange yellow.	Quite solid.
Cotton seed oil.	Yellowish brown.	Reddish brown.	Salve-like or smeary.
Sesamé oil.	White.	Brownish yellow.	Perfectly liquid.
Sunflower oil.	Dirty white.	Reddish yellow.	
Ground nut oil.	Pale rose.	Brownish yellow.	Quite solid.
Rape-seed oil.	Pale rose.	Orange yellow.	Quite solid.
Ricinus oil.	Pale rose.	Golden yellow.	Salve-like or smeary.

—*American Journal of Pharmacy.*

Palm Oil.—Palm Butter, Oleum Palmæ.—This oil is obtained from the fruit of several species of palm, chiefly of *Elæis guineensis*. The nuts or fruit after separation from the spadices containing them are allowed to decompose to a certain extent in the open air. By pounding with wooden pestles the pulp is detached from the hard nuts, mixed with a little water and heated. The oil is then forced out by pressure. This process does not free the oil from all fragments of pulp, and hence it has a great tendency to become rancid and acid. Fresh palm oil has an orange yellow tint, a sweetish taste and an odor somewhat resembling that of violets or orris root. It is of the consistence of butter or lard.

Paper Oil.—Rag Oil, Pyrothonidæ, Oleum Chartæ.—On the small scale by burning paper on a cold tin plate and collecting the oil; on the large scale by the destructive distillation of paper or linen rags. For baldness, toothache, earache, etc.

Perfumery Oils.—*Syn.* Scented Oils, Olea Fixa Odorata, L.—The oils which usually form the basis of these articles are those of almonds, ben or olives; but others are occasionally used. The methods adopted for their preparation vary with the nature of the substances whose fragrance it is intended to convey to the oil. The Continental perfumers employ three different processes for this purpose, which they technically distinguish by terms indicative of their nature. These are as under:

1. A sufficient quantity of the essential oil of the plant, or of the concentrated essence of the substance, if it does not furnish an oil, is added to the fixed oil which it is desired to perfume until the latter becomes agreeably fragrant; the whole is then allowed to repose for a few days, and if any sediment falls (which should not be the case when the ingredients are pure), the clear portion is decanted into another bottle. When alcoholic essences are thus employed the fixed oil should be gently warmed and the admixture made in a strong bottle, so as to permit of it being corked and well agitated with safety; and in this case the agitation should be prolonged until the whole has become quite cold. In this way all the ordinary aromatized and perfumed oils of the English druggists and perfumers, as those of bergamot, cassia, cloves, lavender, lemon, millefleurs, neroli, nutmeg, oranges, roses, etc., are made, but those of a few of the more delicate flowers, and of certain other substances, can only be prepared of the first quality by one or other of the processes described below.

In general 1 to 1½ dr. of the pure essential oil or 3 to 4 dr. of the alcoholic essences are found sufficient to render 1 pt. of oil agreeably fragrant. Half dr. of pure otto of roses is, however, enough for this purpose, owing to the very powerful character of its perfume; but even a less quantity than this is commonly employed on account of its costliness, the deficiency being made up by a mixture of the oils of rhodium, rosemary and bergamot. Most of the oils of this class are intended for hair cosmetics.

2. (By infusion.) Dry substances, after being reduced to powder or sliced very small—flowers or petals, after being carefully selected and picked from the stems and other scentless portions—and soft or unctuous matters, as ambergris, civet or musk, after being rubbed to a paste with a little oil, either with or without the addition of about twice their weight of clean sand or powdered glass, to facilitate the reduction, are digested in the fixed oil for about one hour, at a gentle heat obtained by means of a water bath, continual stirring being employed all the time; the mixture is then removed from the heat, covered up and left to settle until the next day, when the clear portion is decanted into clean bottles. When flowers are employed, the free oil is drained off and the remainder obtained by the action of a press. The process is then repeated with fresh flowers five or six times or even oftener until the oil is sufficiently perfumed. For ambergris, musk or civet the digestion is generally continued for fifteen to twenty days, during which time the vessel is either freely exposed to the sunshine or kept in an equally warm situation.

The first quality of the oils of ambergris, balsam of Peru, benzoin, cassia, cinnamon, civet, orange flowers, orris, roses, styrax and vanilla are made by infusion.

3. (By the flowers.)—*a.* Upon an iron frame a piece of white, spongy cotton cloth is stretched and then moistened with almond or olive oil, usually the latter; on the cloth is placed a thin layer of the fresh plucked flowers; another frame is similarly treated, and in this way a pile of them is made. In twenty-four or thirty hours the flowers are replaced by fresh ones, and this is repeated every day or every other day until seven or eight different lots of flowers have been consumed, or the oil is sufficiently loaded with their odor. The oil is then obtained from the cotton cloth by powerful pressure and is placed aside in bottles to settle, ready to be decanted into others for sale. Sometimes thin layers of cotton wool, slightly moistened with oil, are employed instead of cotton cloth.

The oils of all the more delicate flowers, such as those of honeysuckle, jasmin or jessamine, jonquil, may blossom, myrtle blossom, narcissus and violet are generally prepared in the above manner.

b. The native perfumers of India prepare their scented oils of bela, chumbul, jasmin, etc., in the following manner: A layer of the scented flowers about 4 in. thick and 2 ft. square is formed on the ground, over this is placed a layer of moistened tel or sesamum seeds 2 in. thick, and on this another 4 in. layer of flowers. Over the whole a sheet is thrown which is kept pressed down by weights attached round the edges. The flowers are replaced with fresh ones after the lapse of twenty-four hours and the process is repeated a third and even a fourth time when a very highly scented oil is desired.

The swollen sesamum seeds, rendered fragrant by contact with the flowers, are then submitted to the action of the press, by which their bland oil is obtained strongly impregnated with the aroma of the flowers. The expressed oil is then set aside in dubbers (bottles made of untanned hides) to settle. We have employed poppy seed in this country in a similar manner with great success.

c. The flowers are crushed in a mortar or mill with one half their weight of blanched sweet almonds, and the next day the massis gently heated and submitted to the action of a powerful press; the liquid thus obtained is allowed to repose for a week, when the upper portion of oil is decanted and filtered. This plan is occasionally adopted in this country for the oils of roses and of a few other flowers.

The solution of a few grains of benzoic acid or of gum benzoin (preferably the first) in any of the above oils will materially retard the accession of rancidity, if it does not prevent it altogether.

The oils of the last two classes (2 and 3) are chiefly used to impart their respective odors to the simple oils, pomades, etc.; and in the manufacture of scented spirits or esprits.

Petroleum.—Various suggestions have been made to account for the occurrence of native naphthas. It is most generally believed that the chief cause is the decomposition, at great depths beneath the earth's surface, of vegetable and animal remains, but it is by no means known with any certainty how this decomposition has been brought about, whether it is still going on, or whether the process has long ceased to be in active operation. Mendelejeff supposes, that as a consequence of the condensation of the earth's substance from vapors, the interior must consist of metals, chiefly iron, in combination with carbon, and that water, acting on these carbides at high temperatures and pressures, produced metallic oxides and hydrocarbons, which latter, rising in a state of vapor, become condensed in the superincumbent strata, especially in porous sandstones. Most probably, however, more than one cause has been at work, and possibly the American deposits occuring in Palæozoic strata may be due to causes differing from those which have originated the Russian petroleum occurring in Tertiary formations.

Petroleum can rarely be procured without boring wells, from which it is obtained by pumping, or, in some cases, by means of buckets and windlass. In America the boring is very rapidly accomplished. Prof. Dewar states that wells of 1,500 to 2,000 ft. in depth are pierced in from about one to two months.

The oil is largely conveyed from the neighborhood of the wells by pipes, and these pipe lines have, since 1865, become a great feature of the American oil industry. The oil from many thousand wells is passed through these pipes, the aggregate length being several thousand miles, worked by various companies.—*Revue Scientifique.*

Piney Oil.—Piney Tallow, P. Dammar, P. Resin.—To prepare this oil the seeds of *Vateria indica*, or piney tree, are roasted, then ground, and boiled with water. The oil is skimmed off. When cold it is a solid fat, which melts at about 95° to 97° F. Its specific gravity is about 0·926. Its color is white, and it has a somewhat fragrant odor. It is made into candles.

Poppy Seed Oil.—Syn. Oleum papaveris.—Obtained from the seeds of *Papaver somniferum*, the opium poppy; *Glaucium luteum*, the yellow horn poppy, and *Argemone mexicana*, the spiny poppy, by pressure. It is of a pale color and slightly sweet taste. It dries and keeps well, and has a specific gravity of 0·913-0·924. It is used for salads, paints and soaps, and also extensively to adulterate almond oil. It does not freeze till cooled to 0° F. The yield of the seeds is from 32 to 48%.

Printing Oil for Pottery.—1. One qt. linseed oil, 1 pt. rape oil, 2 oz. balsam capivi, 1 oz. pitch ½ oz. amber oil, ½ oz. white lead.

2. One qt. linseed oil, ¼ pt. rape oil, ¼ pt. common tar, 1 oz. balsam sulphur, 1 oz. balsam capivi. The linseed oil should be boiled for some time alone, then add the rape oil and the balsam capivi, allow the boiling to be continued until it begins to approach the proper consistency, and add the remaining ingredients. The mixture should be allowed to cool a short time, after which the whole mass may be boiled slowly until it has assumed the proper thickness; the vessel must be generally covered during the process, and the sulphur, previously to being mixed with the oil, should be perfectly pulverized, as by that means it is less liable to curdle the oil.

Rapé Seed Oil. See *Colza Oil* above.

To Prevent Fats and Oils from Becoming Rancid.—Take 2 drm. powdered slippery elm bark to 2 lb. of the fat. Heat together for a few minutes. The bark shrinks and subsides, after which the fat is poured off. It gives an odor to the fat like that of a hickory nut.

Red Oil.—One pt. linseed oil, ¼ lb. alkanet root. If mahogany be allowed to stand all night wiped over with this previous filling in, it will impart a deep rich color, also useful for walnut and rosewood.

Refining Oils.—1. Mr. Bancroft refines oils for machinery and lubricating purposes generally by agitating them with a lye of caustic soda of the sp. gr. 1·2. A sufficient quantity is known to have been added when, after repose, a portion begins to settle down clear at the bottom. About four to eight per cent. is commonly required for lard oil and olive oil. After twenty-four hours' repose the clear supernatant oil is decanted from the soapy sediment, and filtered.

2. *Fish Oil (Whale, Seal, etc.)* is purified by—

a. Violently agitating it with boiling water or steam, by placing it in a deep vessel with perforated bottom, through which high pressure steam is forced for some time; it is afterward clarified by repose, and filtered through coarse charcoal.

b. The oil is violently agitated with a boiling hot and strong solution of oak bark, to remove albumen and gelatine, and next with high pressure steam and hot water; it is lastly dried and filtered.

c. Each ton is boiled for half an hour with caustic soda, ½ lb., previously made into a weak lye with water; or steam is blown through the mixture for a like period; sulphuric acid, ½ lb., diluted with six times its weight of water, is next added; the whole again boiled for fifteen minutes and allowed to settle for an hour or longer, when the clear oil is run off from the water and sediment into the bleaching tubs; here solution of bichromate of potash, 4 lb., in oil of vitriol, 2 lb., previously diluted with water, q. s., together with a little nitric acid and some oxalic acid, are added, and after thorough admixture of the whole, by blowing steam through it, strong nitric acid, 1 lb., diluted with water, 1 qt., is poured in, and the boiling continued for half an hour longer; a small quantity of naphtha or rectified spirit of turpentine is then mixed in, and the oil is finally well washed with hot water and left to settle.

3. For Palm Oil.—The oil is melted by the heat of steam, and after it has settled and cooled down to about 130° F., is carefully decanted from the water and sediment into the steaming tubs; here a mixture of a saturated solution of bichromate of potash, 25 lb., and sulphuric acid, 8 or 9 lb., is added, and after thorough admixture, hydrochloric acid, 50 lb., is poured in; the whole is then constantly stirred until it acquires a uniform greenish color, or is sufficiently decolored, a little more of the bleaching materials being added if the latter is not the case, after which it is allowed to repose for half an hour to settle; it is next run

into a wooden vat, where it is washed, etc., as before.

4. Almond, castor, linseed, nut, olive, rape, and some other vegetable oils are readily bleached by either of the following processes:

Exposure in glass bottles to the sun's rays on the leads or roofs of houses, or in any other suitable position, open to the southeast and south. This is the method employed by druggists and oilmen to whiten their castor and linseed oils. Fourteen to twenty-one days' exposure to the sun in clear weather during summer is usually sufficient for castor oil when contained in 2 to 4 qt. pale green glass bottles (preferably the former), and covered with white gallipots inverted over them. The oil is filtered before exposing it to the light, as, if only in a slight degree opaque, it does not bleach well. Almond and olive oil are, when thus treated, apt to acquire a slight sulphurous smell; but this may be removed by filtration through a little animal charcoal, or still better, by washing the oil with hot water.

Restoration of Resinified Volatile Oils.—When oils have become resinified, they may be restored by rectification. This is accomplished by mixing the volatile oil with half of its own weight of an inodorous fat, and distilling the mixture from a 3% solution of table salt. If the quantity of resinified oil is too small to be distilled, it may be treated as follows: Agitate the oil for about 15 or 20 minutes with a magma formed by mixing a solution of borax with animal charcoal, when the resinified portion will unite with the borax, leaving the oil limpid and the odor restored.

Rosin Oil.—*100 lb.* of dry, thick rosin oil are heated until thin; the fire is then removed and 2 lb. fuming sulphuric acid (Nordhausen) are gradually added, with constant stirring. After mixing for half an hour allow it to stand for twelve hours; then siphon off and wash with hot water until the water shows no acid reaction. After several days' separation, a dark yellow, faintly odorous rosin oil is obtained without blue reflection. This oil mixed with other oils may be used advantageously for lubricating the heavy parts of machinery.

Seal Oil.—This oil is chiefly prepared from the blubber of the hooded seal (*Phoca cristata*), and of the harp seal (*Phoca Greenlandica*), but also from several other species of seal. Pale seal oil is that which drains from the blubber before putrefaction commences, and forms about 60% of the whole quantity of oil obtained. It is very clear, odorless, and when recently prepared not unpleasant to the taste.

Refined seal oil is the last washed and filtered. It ranks close after sperm oil.

Brown or dark seal oil is that which subsequently drains from the putrid mass. It is very strong scented and nauseous, and smokes in burning. A full grown seal yields from 8 to 12 gal. of oil, a small one 4 to 5 gal.

Rock Oil.—Name sometimes given to petroleum.

Rosin Oil.—A product of the dry distillation of resin.

Shark or Shark Liver Oil.—Prepared from the liver of various species of shark. One liver yields from 15 to 60 gal. of oil. It is the lightest of the fixed oils, its specific gravity ranging from 0·865 to 0·876. Besides being employed in the adulteration of cod liver oil, it is largely used in tanneries.

Sheldrake's Oil, for Grinding Colors.—Pale old boiled oil, copal varnish, equal parts. Mix. This will remain good for a long time if kept in well corked bottles.

Sperm Oil.—This oil is procured from the head matter of the sperm whale or cachalot (*Physeter macrosephalus*), a species once common in all the principal seas, but now chiefly confined to the Southern oceans. It is a very limpid oil, comparatively free from smell, and burns well. It has long been reputed the best oil for lamps and machinery, as it does not thicken by age or friction. Its specific gravity is 0·875. Refined seal is a common adulterant. The solid portion is refined for candle making.

Spike Oil, (Farrier's).—Oil of turpentine, 1 qt.; Barbadoes tar, 1½ oz.; alkanet root, ½ oz.; digested together for a week. Used as a stimulating liniment by farriers.

1. Painter's.—Rectified oil of turpentine, 3 pt.; oil of lavender 1 pt. Mix.

2. Oil of turpentine, warm, 5 parts; lavender oil bottoms, genuine, 3 parts; agitate well together and in two weeks decant the clear away. Used by artists and enamelers.

Styrax Oil.—Liquid styrax, pure, 5 drm.; oil of nutmeg, 10 drops; ambergris, 6 grn.; oil, 1 pt.; by infusion.

Tallow Oil.—Tallow is the name given to the fat separated from the membranes inclosing it in the suet or solid fat as obtained from oxen, sheep and other ruminants. This oil corresponds to tallow as lard oil to lard, and is obtained from tallow by pressure. The tallow is first melted, and the clear portion is drawn off, after the subsidence of impurities, into tubs fitted with perforated diaphragms covered with coarse flannel. As cooling proceeds, olein separates from the solid portions of the fat, the liquid oil is run off, pressure applied, and more oil obtained. It is very useful in the manufacture of the finer kinds of soap.

Oil of Turpentine.—Spirit of T., essence of T., Turps, Camphene, Camphine, Terebinthinæ Oleum, Spiritus Terebinthinæ, Essentia T., Oleum Terebinthinæ, O. T. Purificatum.

The oil of turpentine of commerce is obtained by distilling strained American turpentine along with water. The residuum in the still is resin or rosin. The product in oil varies from 14% to 16%. It may be rectified by redistilling it along with 3 or 4 times its volume of water, observing not to draw over quite all of it. The portion remaining in the retort, balsam of turpentine, is viscid and resinous. A better plan is to well agitate it with an equal measure of solution of potassa or milk of lime before rectifying it. This is the plan adopted for the camphine used for lamps. By agitating crude oil of turpentine with about 5° of sulphuric acid, diluted with twice its weight of water, and after repose and decantation, rectifying it with five or six times its volume of the strongest lime water, a very pure and nearly scentless oil may be obtained. Pure oil of turpentine is colorless, *limpid, very mobile,* neutral to test paper, has an odor neither powerful nor disagreeable when recently prepared, but becoming so by exposure to the air. Hot strong alcohol dissolves it freely, but the greater part separates in globules as the liquor cools. It congeals at 14° and boils at 312° F. It is extensively used in the manufacture of varnishes and paints. To prevent accident it is proper to caution the operator of the extremely penetrating and inflammable nature of the vapor of this oil, even in the cold. During the process of distillation, without the greatest precautions are taken, an explosion is almost inevitable.

Vanilla Oil.—Huile à la Vanille.—Purest olive or almond oil, 1½ pt.; vanilla, finest in powder, 2 oz.; oil of bergamot, 1 drm.; otto of roses, finest, 15 drops; by infusion.

Oil, Watchmaker's.—Prepared by placing a clean strip or coil of lead in a small white glass bottle filled with pure almond or olive oil, and exposing it to the sun's rays at a window for some time, till a curdy matter ceases to be deposited and the oil has become quite limpid and colorless. Used for fine work; does not become thick by age.

Oil, Whale, Train Oil, Whale Train Oil, Oleum Balænæ, Oleum Ceti.—From the blubber of the *Balæna mysticetus,* Linn, or the common or Greenland whale, by heat. Coarse with bad odor. Southern whale oil is the best. Used for lamps, machinery, etc. Product per fish about 1½ tons for each foot of bone.

White Oils.—1. White Egg Oils.—Yelks of 4 eggs; oil of turpentine, ¼ pt.; mix, add of ammonia liquor, 3 oz.; oil of origanum, ½ oz.; soaper's lye, ¼ pt.; water, ¾ pt.; agitate well and strain through a coarse hair sieve.

2. Rape oil, ¾ pt.; liquor of ammonia and oil of turpentine, of each, 3 oz.; agitate until they form a milk.

3. Redwood.—Whites and yelks of 2 eggs; oil of turpentine, 1½ oz.; triturate together; add of Goulard's extract, ½ oz.; mix; next add of distilled vinegar, 1½ pt.; and lastly of rectified spirit, 1½ oz. Stimulant and detergent. Used by farriers.

Oilskins. See **Waterproofing.**

Oilstones.—*Oilstones, to Face.*—Take a piece of iron with even or straight face (it ought to be planed); scatter a little emery or fine sand about as coarse as No. 1½ sand paper on the iron plate, add a little water and rub the face of the stone, renewing the emery or sand and water as requisite, finishing with an addition of water without emery or sand. This is the quickest and truest way, making the stone perfectly straight, and occupying from five to ten minutes' time.

Oilstones, to Renew.—Try turpentine to clean with. The reason of oilstones becoming hard is that the pores fill up by the oil becoming viscid or gummy and mixed with the particles of steel rubbed off in the process of sharpening, thus preventing the tool from touching the stone, by causing it to ride upon the surface of a substance as hard as itself. There is a secret, known only to a limited number, that oil mixed with a small portion of turpentine makes a stone cut freely; and here let me remark that no oil that is of a vegetable character, such as sweet oil, is fit for a stone; petroleum is little better. The very best that can be used is neatsfoot oil, which may become thick and pasty, but is always reliable; so are all of the animal or fish oils. That which is obtained from poultry is good; some prefer goose oil to use on a stone for razors, and some mechanics in Philadelphia substitute soap suds for the purpose.

Oilstones, to True.—For truing an ordinary oilstone for sharpening planes, take a sheet of glass paper No. 2, and place it on the bench. Rub the stone over it. In this way the stone can be trued in one quarter the time required by the ordinary process.

Ointments.—*Ointment of Benzoin.*—Though benzoin is introduced into lard to keep it, and this is not needed with vaseline, an ointment made as follows (similar to U. S. P.) yields a preparation that preserves the odor of the resin without dissolving the same, and has when finished an elegant quinescent appearance. As an addition to a lard ointment this would be good, probably preventing rancidity without introducing the irritating effect of the resin.

Tincture of benzoin	2 fl. oz.
Vaseline	16 oz.

Melt the vaseline on a water bath, add the tincture, stir till all alcohol is dissolved and pour off the liquid from the precipitated resin which adheres to the sides and bottom of the vessel.

It would be needless to remark that, on account of the difficulty of solubility of resins in vaseline, ointment of mezereon cannot be made readily with it.

Ointment of Borax.—

1. Borax in very fine powder . . . . . 1 drm.
   Spermaceti ointment . . . . . 1 oz.

Mix by trituration. In excoriations, chaps, etc. It also forms an excellent lip salve. A drop of neroli, or ½ drop of otto of roses, renders it more agreeable.

2. To the last add of—
   Glycerine . . . . . 1 drm.

Using a slightly warmed mortar for the mixture. Very effective.

Citrine ointment cannot be prepared with vaseline alone, as the water in the nitrate of mercury solution is repelled by the oil. The vaseline becomes decomposed at 400° F., giving rise to brisk effervesence of nitrous fumes, turning red in color. This color cannot be washed out with water, showing that it is not due to an absorption of the red fumes, but rather to some change produced. A writer in *The Druggists' Circular* suggests the addition of ⅛ of vaseline in place of the same quantity of lard, adding it after the decomposition has taken place, as rendering the ointment soft and permanent.

Glycerine Ointment.—

Starch	3 parts.
Glycerine	10 parts.

The starch, finely pulverized, is digested for for about an hour with the glycerine, at the heat of a water bath.

Ointment of Iodine.—Iodine is very soluble in vaseline, and it is supposed enters partially into combination with the hydrocarbon, giving rise to a considerable effervescence (probable hydrogen being displaced). Iodine dissolves slowly in vaseline if allowed to macerate in it or if rubbed up with it, but for ointment of iodine the following gives the best results:

Iodine	20 grn.
Alcohol	sufficient.
Vaseline	1 oz.

Dissolve the iodine in the alcohol, and mix with the vaseline placed on a hot water bath. Very little iodine will be evaporated during the operation.

Iodide of Iron Ointment.—If iron be added to a solution of iodine in vaseline and repeatedly shaken (the whole kept liquid on a water bath), the almost black color of the iodine disappears, and if an excess of iron be employed the color becomes green, and if it be then filtered the ointment will have a beautiful emerald green color through transmitted light and almost black by reflected light.

Iodine	4 drm.
Iron filings	12 drm.
Vaseline	16 oz.

This iodide of iron ointment is stable and almost without taste. Prepare from it a jelly by adding an equal quantity of very fine sugar, in which manner it could be easily taken by children. Mr. E. Fougera, of Brooklyn, has also prepared a bromide and chloride in like manner, and suggests its use in keeping the protosalts of iron by enveloping them in it.

Ointments for the Itch.—The usual treatment of itch has been noticed elsewhere, and various lotions, ointments and pommades, of more or less value in its treatment, will be found under the names of their leading ingredients. Here are a few additional formulæ:

1. (French Hospital):

Chloride of lime	1	drm.
Rectified spirit	2	fl. drm.

Rub together, add of—

Sweet oil	½	fl. drm.
Soft soap	2	oz.
Oil of lemon	½	fl. drm

Mix perfectly, and then further add, of—

Common salt	1	oz.
Sulphur	1	oz.

Cheap, very effective, and much less offensive than sulphur ointment.

2. (Le Gros):

Iodide of potassium	½	drm.
Lard	1	oz.

Mix. Cleanly, harmless and effective.

3. (Robertson):

Soft soap	1	oz.
Rum or (proof spirit)	1	tablespoonful.
Chloride of lime (dry and good)	¼	oz.

Mix and add of—

Lard	2	oz.

Said to be a very effective and cleanly remedy.

4. (Jackson):

Palm oil	1 oz.
Sulphur	1 oz.
White hellebore	1 oz.
Lard	2 oz.

Mix. Should be used with caution.

5. Take bichloride of mercury, 1 part; lard, 15 parts. Mix well together,

Ointment of Iodide of Mercury.—Lard, 3 oz.; iodide of mercury, 45 grains. Mix well.

Neuralgic Ointment:

Menthol	45 grn.
Cocaine	15 grn.
Chloral	10 grn.
Vaseline	5 drm.

To be applied to the painful part.

Ointment, Simple.—1. Olive oil, 5½ fl. oz.; white wax, 2 oz.; melted together and stirred while cooling.

2. Prepared lard, 4 lb.; white wax, 1 lb.; as the last.

3. White wax, 2.; prepared lard, 3.; almond oil, 8.; melt together and stir until it becomes solid. The above are mild emollients, useful in healthy ulcers, excoriations, etc., but chiefly as forming the basis of other ointments.

Sulphur Ointment:

Sublimed sulphur	1 oz.
Lard	4 oz.

Mix thoroughly, by trituration. These are the proportions of the new Br. and the E. and D. Ph. In the last London Ph. a larger quantity of sulphur is ordered.

The compound sulphur ointment of the London Ph. consists of—

Nitrate of potassa (in fine powder)	40	grn.
White hellebore (in fine powder)	10	drm. (troy)
Sulphur	4	oz. (troy).
Soft soap	4	oz. (troy).
Lard	1	lb. (troy).

It is said to be more efficacious than the simple ointment; but is apt to irritate a delicate skin.

Ointment of White Wax:

1. White wax (pure) 2 oz.
Prepared lard 3 oz.
Almond oil 3 fl. oz.

Melt them together, and stir the mixture until it solidifies. This is the unguentum simplex of the new British Pharmacopœia.

2. White wax 2 oz.
Olive oil 5½ fl. oz.

As before. A mild emollient, in various applications, but chiefly as a basis for other ointments and medicated pommades. On the Continent it is regarded as more healing when made with yellow wax.

Spermaceti Ointment. — Simple ointment, emollient dressing, etc.

1. Spermaceti 5 oz.
White wax (pure) 2 oz.
Almond oil 1 pt.

Melt them together by a gentle heat, and stir constantly until the whole solidifies.

Ointment of Creosote:

Creosote	1 fl. drm.
Spermaceti ointment	1 oz.

Triturate them together, in a slightly warmed mortar, until perfectly united, and subsequently until nearly cold.

Onions, Metal. See **Alloys.** (*Fusible.*)

Opals, to Restore the Polish.—By rubbing with oxide of tin or putty powder on a piece of chamois skin, wet; finish with refined chalk, also on chamois skin, wet, then wash the opal with a soft brush and water. With a little care this may be done without taking it from the setting.

Opodeldoc.—Steer's opodeldoc is as follows: White Castile soap, cut small, 2 lb.; camphor, 5 oz.; oil of rosemary, 1 oz.; oil of origanum, 2 oz.; rectified spirit, 1 gal.; dissolve in a corked bottle by the heat of a water bath, and when quite cool, strain; then add ammonium hydroxide, aqua ammonia, 11 oz.; immediately put it in bottles, cork close, and tie over with bladder. It will be very fine, solid, and transparent when cold. The liquid opodeldoc is prepared by taking 2 oz. Castile soap shavings, and dissolving them in one quart alcohol, with gentle heat; then add 1 oz. camphor, ½ oz. oil rosemary, and 2 oz. spirits hartshorn, aqua ammonia.

Optical Instruments.—*Blue or Gray Finish on.*—The steel gray or bluish tint upon instruments is made by dipping or washing with chloride of platinum solution, which is made by dissolving platinum in 2 parts muriatic (hydrochloric) acid, 1 part nitric acid, mixed; as much platinum as the quantity of acid you may wish to prepare will take up. Use platinum foil, put the whole in a glass bottle with wide mouth, cover loosely, and place in warm sand bath or any place where it will be as hot as boiling water for a few days, when it will be ready for use. As soon as the proper color is produced wash the articles in water. If the solution is not saturated, the brass will turn brown and rough.

Orangeade.—1. Pare off the thin, yellow rind of 4 oranges and infuse in ½ pt. boiling water. Express the juice of 12 Florida oranges and strain through a hair sieve; add to this ¾ lb. of fine white sugar, the infusion from the rinds and 1 qt. of water. Ice the orangeade.

2. Slice crosswise 4 oranges and 1 lemon; put them into an earthen jug with 4 oz. of lump sugar; pour upon these 1 qt. of boiling water and allow to stand covered for 1 hour. Decant and ice.

3. Simple sirup, ½ fl. oz.; tincture of orange peel, ½ dr.; citric acid, 1 scruple; fill the bottle with aerated water.

Orangeade, Effervescing or Aerated or Sherbet.—1. Mix 1 lb. of sirup of orange peel, 1 gal. of water, and 1 oz. citric acid, charge strongly with carbonic acid gas, with a machine.

2. Sirup orange juice, ¾ oz.; aerated water, ½ pt.

3. Mix 1 lb. sirup of orange peel, 1 gal. water and 1 oz. citric acid, and charge it strongly with carbonic acid gas, with a machine.

4. Sirup of orange juice, ¾ fl. oz.; aerated water, ½ pt.

Orange Glass Substitutes. See **Photography.**

Orcein.—Lichen Lake. — A brownish-red powder, nearly insoluble in water, obtained by dissolved orcin in ammonia, exposed to air and precipitated with dilute acetic acid. Produces purple when dissolved in solution of ammonia.

Orcin.—The general product of the decomposition of the acids obtained from the tinctorial lichens under the influence of heat or the alkaline earths.

Ore.—An ore is a substance containing a metal in its natural state, chiefly as sulphide, oxide, or carbonate, and less frequently as arsenide, chloride, sulphate, phosphate and silicate.—*Hiorns.*

Or Molu, or Ormulu. See **Alloys.**

Ornaments, Composition for. See **Compositions.**

Oroide. See **Alloys.**

Orpiment.—Yellow sulphide of arsenic. It forms the basis of the pigment called king's yellow.

Ostrich Feathers, to Clean. See **Cleansing,** *Feathers.*

Ostrich Feathers, to Dye. See **Dyeing.**

Ottawa Beer. See **Beers.**

Oxidation.—This term means the combination of bodies with oxygen. It is of the greatest importance, and cannot afford to be overlooked. Many chemicals oxidize instantly when exposed to the air—this must be borne in mind. Many of the greatest processes in manufacturing chemicals depend upon this union with oxygen. Rust (which see) is the result of the oxidation of the iron.

Oxidizing *with Solution of Platinum.*—Dissolve sufficient platinum in aqua regia, and carefully evaporate the resulting solution (chloride of platinum) to dryness. The dried mass may then be dissolved in alcohol, ether, or water, according to the effect which it is desired to produce, a slightly different effect being produced by each of the solutions. Apply the solution of platinum with a camel's hair brush, and repeat the operation as often as may be necessary to increase the depth of tone. A single application is frequently sufficient. The ethereal or alcoholic solution of platinum must be kept in a well stoppered bottle, and in a cool place. The aqueous solution of platinum should be applied hot.

Oxidizing Copper and Brass.—Immerse the articles in a solution of 2 oz. nitrate of iron and 2 oz. hyposulphite of soda to 1 pint of water, until the desired shade of oxidation is acquired, then wash, dry, and brush.

Silver, to Oxidize.—1. Add 4 or 5 thousandths of ammonium sulphide or potassium sulphide to water, at a temperature of 160° to 180° F. When the articles are dipped into this solution, an iridescent coating of silver sulphide is produced, which after a few seconds turns blue black if allowed to remain in the liquid. Remove, rinse, scratch-brush, and burnish when desired.

2. There are two distinct shades in use, one produced by a chloride, which has a brownish tint, and the other by sulphur, which has a bluish black tint. To produce the former, it is only necessary to wash the article with a solution of sal ammoniac (ammonium chloride).

3. A much more beautiful tint may be obtained by employing a solution composed of equal parts of copper sulphate and ammonium chloride in vinegar (or dilute acetic acid). The fine black tint may be produced by a slightly warm solution of sodium or potassium sulphide.

4. Bromine, 5 grn.; potassium bromide, 5 dwt.; water, 10 oz.; boil the silver in this usually two to five minutes, then polish with rouge.

5. Dissolve sulphate of copper, 2 dwts; nitrate of potash, 1 dwt.; ammonium chloride, 2 dwts.; in a little acetic acid. Warm the article and apply the solution with a camel hair pencil and expose to the fumes of sulphur in a closed box. Parts not to be colored must be coated with wax.

6. Dip the clean silver article in a solution of sulphide of potassium (liver of sulphur), 2 drm., to a pt. of water. Heat this solution to a temperature of 175° F. Immerse for a few seconds only, when the article becomes blue black. For a velvet black, dip the article, previous to oxidizing, in a solution of mercurous nitrate and water and rinse. Then dip in the sulphide solution as above. For a brown shade, oxidize in the potassium sulphide as above, then dip in a liquid composed of 10 parts blue vitriol and 5 parts sal ammoniac to 100 parts vinegar. After oxidation brush with a scratch-brush very lightly, to brighten and variegate the surface. There are many other methods, among which will be found the following:

7. Expose to the vapor of chlorine.

8. Use a solution of equal parts copper sulphate and ammonium chloride dissolved in vinegar.

9. Potassium sulphide dissolved in warm water.

10. Sodium sulphide dissolved in warm water.

11. Wash with a solution of ammonium chloride.

Oxychloride.—A term often loosely applied to compounds of an oxide and chloride.

Oxygen.—Oxygen may be obtained on a small scale very readily by simply heating in a close retort a mixture of 4 parts chlorate of potash and 1 part black oxide of manganese. If large quantities are desired, the continuous process of T. Du Motay may be employed. The principle of this process resides in the fact that the manganates and permanganates of potash, soda and baryta, the ferrates and chromates of the same bases, and in general all metallic oxides and acids which will form, with potassa, soda or baryta, binary compounds capable of superoxidizing, possess the property of yielding their oxygen, at a more or less elevated temperature, when they are submitted to the action of a current of steam. These bodies, thus deoxidized, also possess the property of reoxidizing themselves when they are exposed to a temperature more or less great. The atmosphere is therefore the constant source from which the oxygen is derived. The mode of operation is the following: One of the binary compounds just enumerated is placed in a distilling vessel, whether at the maximum or minimum state of oxidation. If the compound is in the latter condition, it is oxidized by means of a current of air mechanically drawn over it; if at the former stage, it is deoxidized by means of a current of steam. The oxygen and steam, on issuing from the mouth of the retort, pass together into a condenser, where the steam is separated by condensation, while the oxygen passes over into a gas holder, and is there collected. When all the utilizable oxygen has been disengaged by the steaming process, the action of superoxidation by means of the air current is recommenced. By this alternate process the oxygen is generated as long as may be required.

Oxymel.—An acidulous sirup made of honey and vinegar.

Oxymel.—Clarified honey, 0·32 oz. (avoirdupois); acetic acid, 4 fl. oz.; distilled water, 4 fl. oz. Liquefy by heat (Br. Ph.).

Oysters, to Preserve.—A method of preserving oysters is adopted by the Chinese. The fish are taken from the shells, plunged into boiling water for an instant, and then exposed to the sun till all the moisture is removed. They remain fresh for a long time, and retain their full flavor. Only the fattest can be so treated. Oysters are also largely canned, much in the same way as salmon.

Ozokerit.—*Syn.* Mineral Wax.—A brown (sometimes yellow or black) compact substance found in the tertiary strata, mostly in close proximity to coal measures. Melts at a temperature of from 60° to 80° C.

Ozone Paper. See **Paper.**

Ozone, to Produce.—Ozone may be easily produced by means of an aqueous solution of permanganate of potash and oxalic acids. A very small quantity of these salts, placed in an open porcelain dish, is all that is necessary, the water being renewed occasionally, as it evaporates. Metallic dishes should not be used.

Ozonin.—Ozonin is a patented bleaching compound. It is prepared by dissolving 125 parts of rosin in 200 parts of oil of turpentine, and then stirring in, first a solution of 22·5 parts of potassium hydrate in 40 parts of

water, and after that 90 parts of hydrogen peroxide. The resulting gelatinous mass, when exposed to sunlight for two or three days, is converted into a mobile liquid, and is then ready for use. Mix with water in the proportion of 1 grm. to 1 liter. This ozonin acts as an energetic bleacher, and may be used in either alkaline or acid fluids.

Packfong. See **Alloys.**

Pads, Composition for Padding Paper.—The regular composition used is made from best glue and glycerine and water colored with aniline. This needs heating. A solution of gum tragacanth with a little glycerine might answer your requirements, but we advise the first. For 5 lb. of dry glue allow 1 lb. of glycerine.

Pad, Copying. See **Hektograph.**

Pads, Glue for. See **Glues.**

Pads, Paste for. See **Pastes.**

Pad (Ever Ready) for Rubber Stamps.—The following is said to be a cushion that will give color permanently. It consists of a box filled with an elastic composition, saturated with a suitable color. The cushion fulfills its purpose for years without being renewed, always contains sufficient moisture, which is drawn from the atmosphere, and continues to act as a color stamp cushion so long as a remnant of the mass or composition remains in the box or receptacle. This cushion or pad is too soft to be self-supporting, but should be held in a low, flat pan, and have a permanent cloth cover. The composition consists preferably of 1 part gelatine, 1 part water, 6 parts glycerine, and 6 parts coloring matter. A suitable black color can be made from the following materials: 1 part gelatine glue, 3 parts lampblack, aniline black, or a suitable quantity of logwood extract, 10 parts of glycerine, part absolute alcohol, 2 parts water, 1 part Venetian soap, ¼ part salicylic acid. For red, blue or violet, 1 part gelatine glue, 2 parts aniline of desired color, 1 part absolute alcohol, 10 parts glycerine, 1 part Venetian soap, and ¼ part salicylic acid. The following are two additional receipts used for this purpose: 1. Mix and dissolve 2 to 4 drm. aniline violet, 15 oz. alcohol, 15 oz. glycerine. The solution is poured on the cushion and rubbed in with a brush. The general method of preparing the pad is to swell the gelatine with cold water, then boil and add the glycerine, etc. A full description of the general method will be found under the Hektograph.

2. Aniline violet, 90 gr.; boiling rain water, 1 oz.; to which is added a little glycerine and a small quantity of molasses. The quantities of last two ingredients will vary with the season, but half a teaspoonful will be ample for the quantities of violet and water specified.

Pain Killer.—Spirit of camphor, 2 oz.; tincture of capsicum, 1 oz.; tincture of guaiac, ½ oz.; tincture myrrh, ½ oz.; alcohol, 4 oz.

Paint Brushes, to Clean. See **Cleansing.**

Painters' Cream. See **Cream, Painters'.**

Paint, Fireproof. See **Fireproofing.**

Paint, to Remove. See **Cleansing.**

Paints, Face. See **Rouges.**

Paints and Painting.—Papering and painting are best done in cold weather, especially the latter, for the wood absorbs the oil of paint much more than in warm weather; while in cold weather the oil hardens on the outside, making a coat which will protect the wood instead of soaking into it.

Preparing the Work.—In preparing work for painting, too much care cannot be exercised, as succeeding coats and the final result depend very much on the proper condition of the work when the priming coat is applied. First all the rough places in the wood should be rubbed down with a block covered with sandpaper, and the mouldings and deals should be well cleaned out with sandpaper. Then, as this is a matter of prime importance, every knot, however small, every indication of sap on the wood, or discoloration of any kind, and every appearance of pitch or gum, should be carefully varnished over with white shellac varnish, if the work is to be finished in white or light tints, or with varnish made from unbleached or common shellac, if the work is to be finished in dark shades. The common shellac, in the latter case, answers equally well with the bleached article, and at less cost. This should not, under any circumstances, be neglected, as it is impossible, in the nature of things, otherwise to make good work.

When work is to be finished in two coats, the putty used for stopping the nail heads and other indentations should be made of white lead, worked up with common whiting to the proper consistency, and the filling should be done after the first coat shall have become well dried. When more than two coats are to be applied, the filling should be done between the first and second coats, with ordinary pure linseed oil putty.

It should be adopted, as a rule, never to apply pure white as a priming coat; no matter whether the work is to be finished with one or four coats, the result will always be more satisfactory if the first coat be stained. A little finely ground lampblack answers as well for this as anything.

The only way to produce solid, uniform work is by making every suceeding coat lighter in tint than the one which preceded it. This is especially the case with walls and other extended flat surfaces. No matter what the finish is to be, the first coat should always be darker than the one which succeeds it; and the darker the shade of the finishing coat, the more important it is that this rule should be observed. If the work is to be finished with black, prime with black. If with green, let that be the color of all the preceding coats. If with blue, let that color be the groundwork. What can be more stupid than applying to work which is to be finished in imitation of black walnut a priming coat of white? All work should be primed especially with regard to the finishing color.

The exact proportions of ingredients best to be used in mixing paints vary according to their quality, the nature of the work required, the climate, and other considerations. The composition of paints for different coats also varies considerably. The proportions given in the table on page 358 must only be taken as an approximate guide when the materials are of good quality.

Proportions of Colors for Ordinary Paints.

Colors	Ingredients by weight.						
	White lead.	Lampblack.	Red lead.	Red ocher.	Verdigris.	Burnt umber.	Spanish Brown.
White	100	....	....	....	....	....	....
Black	....	100	....	....	....	....	....
Green	25	....	....	....	75	....	....
Stone	99	....	....	....	....	1	....
Lead	98	2	....	....	....	....	....
Red	....	....	50	50	....	....	....
Chocolate	....	4	....	....	....	....	96

Table showing the Composition of the Different Coats of White Paint and the Quantities required to Cover One Hundred Yards of Newly Worked Pine.

	Red lead.	White lead.	Raw linseed oil.	Boiled linseed oil.	Turpentine.	Driers.	Remarks.
Inside work, four coats not flatted.	lb.	lb.	pt.			lb.	
Priming	½	16	6	.....	.....	¼	Sometimes more red lead is used and less drier.
Second coat	*	15	3½	.....	1½	¼	* Sometimes just enough red lead is used to give a flesh-colored tint.
Third coat	....	13	2½	....	1½	¼	
Fourth coat	.....	13	2½	.....	1½	¼	
Inside work, four coats and flatting.							
Priming	1½	16	6	.....	½	1-8	
Second coat	.....	12	4	.....	1½	1-10	
Third coat	.....	12	4	.....	0	1-10	
Fourth coat	.....	12	4	.....	0	1-10	
Flatting	.....	9	0	.....	3½	1-10	
Outside work, four coats not flatted.							When the finished color is not to be pure white, it is better to have nearly all the oil boiled oil.
Priming	2	18½	2	2	....	1-8	All boiled oil does not work well.
Second coat	....	15	2	2	½	1-10	For pure white, a larger proportion of raw oil is necessary, because boiled oil is too dark.
Third coat	.....	15	2	2	½	1-10	
Fourth coat	.....	15	3	2½	0	1-10	

For every 100 sq. yd. besides the materials enumerated in the foregoing, 2½ lb. white lead and 5 lb. putty will be required for stopping. The area which a given quantity of paint will cover depends upon the nature of the surface to which it is applied, the proportion of the ingredients, and the state of the weather. When the work is required to dry quickly, more turpentine is added to all the coats. In repainting old work, two coats are generally required, the old paint being considered as priming. Sometimes another coat may be deemed necessary. For outside old work exposed to the sun, both coats should contain 1 pt. turpentine and 4 pt. boiled oil, the remaining ingredients being as stated in the foregoing table. The extra turpentine is used to prevent blistering.

There is not half enough of dark colors used in priming applications. Venetian red, finely ground in boiled oil, deeply stained with black—and used very thin, in order to stain the wood as much as possible—is the best first coat for work which is to be finished in imitation of black walnut or other dark wood. The succeeding coats should be as dark as may be with a view to the proper shade of groundwork for the graining. In such case, if (as must happen in the ordinary course of events) the work becomes bruised or chipped—by an accidental knock from a chair leg or other article of house furniture—the general appearance of it is little impaired thereby. Quite the contrary, however, is the case if the underneath coats are white. Then an accident of the kind before mentioned, shows a white spot, which staringly proclaims the work to be a delusion and a sham. Dark colors, too, as the Venetian red before mentioned, make better foundations than white lead or zinc. They dry harder and rub better, and, what is most important, cost less.

This matter having been duly considered, let us now proceed to the coats succeeding the first. Before applying a second coat, the first should be carefully rubbed, and all the nail heads and other indentations carefully stopped with pure linseed oil putty—using for flat surfaces a square bladed putty knife. Puttying with the fingers should never be tolerated (good work is now the subject under consideration). This done, the whole should be carefully examined to ascertain if the oil in the former coat shall have revealed any resinous or pitchy spots, not previously covered with the shellac. These preliminaries being attended to, the work may be considered ready for a second coat. The directions as to rubbing with sandpaper are to be observed in all the succeeding coats. As a rule, on interior work, paint should never be applied to a surface which has not been previously rubbed.

Every painter has seen (the result, too, of unpardonable negligence) plates of glass so covered with spatters that to remove them would require more time than would serve to paint the woodwork of a full trimmed window.

In priming work which is to be finished in oak, finely ground French ocher is recommended. The objection to this pigment, that it does not work smoothly and easily under the brush, has arisen from its coarseness. Finely ground in boiled oil, it works as smoothly as white lead, and makes an excellent foundation for the succeeding coats.

For walls the first coat should be as dark in shade and as thin as practicable, the object being to stain the plaster as much as possible. Indeed, if the whole mass of plaster could be stained through and through, it would be desirable to so stain it.

The use of glue in wall painting is of doubtful propriety. It should never, under any circumstance, be put on until after the second coat, and then rubbed on with a rag, very tightly. In first class work, however, its use is not recommended.

Plaster mixed with weak glue size—which prevents its setting too rapidly—is the best material for stopping walls preparatory to painting, and each coat of paint should be carefully rubbed with worn sandpaper, before the succeeding coat is put on. For preparing walls a small pocket trowel will be found a most serviceable tool, or a trowel shaped putty knife, which article has come into general use.

The preparation of ceilings for whitewashing (or kalsomining as this operation is sometimes pretentiously called) is an operation requiring some skill and knowledge of how to do it. A dirty ceiling, which has been subjected to successive coats of whitewash, whether of lime, or of whiting and glue size, cannot be made solidly and smoothly white by additional whitewashing. The mass has become spongy, and sucks up the water so quickly that the material cannot be evenly distributed. In such case the only way is to begin anew, to go at once down to hard pan by removing all the previous applications by washing and scraping. This is best effected with a broad bladed, square pointed putty knife, keeping the ceiling wet meanwhile. Plaster (hard finish) is *not* of uniform density, and some spots are much more absorbent than others. To remedy this a mixture of soft soap and alum, dissolved in water, should be applied with a broad kalsomine brush.

It is not assumed that mere verbal instructions can teach the art of whitening or tinting walls and ceilings in water colors. To produce good results, great skill in preparing the materials and dexterity in manipulation are required; and such work should be intrusted only to competent hands. A mass of unsuitable material may be cheaply put upon a ceiling, but when the same shall require repainting, the cost of labor will be greater in removing the previous coating than will be the whole cost of repainting. These remarks, too, apply equally to all kinds of painting; and reference is made to the whitening and tinting of ceilings only, because of the general impression that this kind of work may be performed by anybody. The materials and tools used in painting are too costly to be wasted and worn by incompetent handling.

Taste in Color.—In rooms to be lived in, simple white for color of walls and paint, as well as any extremely dark treatment, should be avoided. The walls of rooms should be such backgrounds as will best suit the complexions and dresses of the larger number of people. Delicate white intensifies by contrast any unpleasantness or want of perfection; extreme dark would make people look white and ghastly. Neutral colors will be found the best—generally some gray or cool color that will contrast with warmth of complexions. On no account let an absolutely pure color be used for general surfaces. Nature provides no such color in pigments. Her yellows are greenish or reddish, and so on. Nor does she use it to any extent in inanimate nature. So much so that you will find that if you have much difficulty in describing a color, you may be certain it is good; the more difficulty the more beauty. Nature trusts mainly to gradations of tone, using vivid color in small quantities only, as in the touches on bright flowers and butterflies. This teaching of nature will be found seconded in the pictures of the greatest artists, and in following such teaching, it is necessary to consider the object to which (in domestic work, say) the rooms are to be devoted. A drawing room, it is agreed, should be light, festive and gay; dining room at once more sober, and with more depth and warmth, as befits its uses. You must also consider the light and shade; openings, and the positions of them; for these may (or may not) effect for you contrast of tone, and may even touch the question of the good sense of your whole scheme of decoration.

Anti-Corrosive Paint.—Take equal parts by weight of whiting and white lead, with half the quantity of fine sand, gravel, or road dust, and a sufficient quantity of coloring matter. This mixture is made in water and can be used as a water color; but it is more durable to dry it in cakes or powder after mixing, and then use it as an oil paint by grinding it again in linseed oil. The preparation of oil recommended for this purpose is 12 parts by weight of linseed oil; 1 part boiled linseed oil, and 3 parts sulphate of lime, well mixed, 1 gal. of this prepared oil is used to 7 lb. of the powder.

Backgrounds, Paint for.—Mix common oil paint with a strong, hot solution of soap. When applied to the background as ordinary paint, it dries with a dull surface and is said not to crack.

Bird Cages, to Paint.—Paint with zinc. Do not use lead. The zinc can be given any desired tint. It is then coated with light polishing copal varnish, after which it is baked or heated at from 100° to 150° F. The varnish known in the trade as extra light polishing varnish is used by several of the prominent bird cage makers.

Blackboards, Paint or Slating for.—1. Paint the board with ordinary black paint such as will dry with a gloss; then apply a coat of black paint, mixed with turps instead of oil, which will dry a dead black.

2. Take ½ lb. logwood and sufficient boiling water to cover it; allow it to stand for twenty-four hours. Strain, and apply the solution, boiling, if possible, twice, allowing the board to dry in the interval. Then dissolve ¼ lb. of copperas in about 1 pt. of boiling water, and apply it boiling, once or twice, according to the degree of blackness obtained. Before using it, rub it over well with rushes, straw, ferns, or shoemakers' heel ball. It may be a little difficult to rub the chalk off at first, but after a forthnight's use that will disappear. Use unprepared chalk, which writes well.

3. Place ¼ lb. of lampblack on a flat piece of tin or iron on a fire till it becomes red, take it off and leave it until sufficiently cool, when it must be crushed with the blade of a knife on a flat board quite fine; then get ½ pt. of spirits of turpentine, mix both together, and apply the mixture with a size brush. If the board is new, it would be well to give it one or two coats of lampblack—not burnt, but mixed with boiled oil—adding ½ lb. of patent driers. After the board is thoroughly dried, apply the burnt lampblack and turpentine. The preparation must be laid on quickly.

4. Dissolve 4 oz. shellac in 1 qt. alcohol; add lampblack, 6 drm.; ultramarine blue, 1 drm.; pumice stone, powdered, 3 oz.; rotten stone, powdered, 2 oz. Have the board dry and free from grease.

Sodium silicate, diluted with water, and colored with lampblack, suspended in a little of the silicate, makes an excellent slating.

5. Lampblack and flour of emery mixed with spirit varnish. No more lampblack and flour of emery should be used than are sufficient to give the required abrading surface. The thinner the mixture the better. Lampblack should be first ground with a small quantity of spirit varnish or alcohol to free it from lumps. The composition should be applied to the smoothly planed surface of a board with a common paint brush. Let it become thoroughly hard and dry before it is used. Rub it down with pumice if too rough.

6. Blackboard wash, or liquid slating.—Five pt 95% alcohol, 8 oz. shellac, 12 drm. lampblack, 20 drm. ultramarine blue, 4 oz. powdered rotten stone, 6 oz. powdered pumice.

7. One gal. 95% alcohol, 1 lb. shellac, 8 oz. best ivory black, 5 oz. finest flour emery, 4 oz. ultramarine blue. Make a perfect solution of the shellac in the alcohol before adding the other articles. To apply the slating, have the surface smooth and perfectly free from grease; well shake the bottle containing the preparation, and pour out a small quantity only into a dish, and apply it with a new flat varnish brush as rapidly as possible. Keep the bottle well corked, and shake it up each time before pouring out the liquid.

8. Half gal. shellac varnish, 5 oz. lampblack, 3 oz. powdered iron ore or emery; if too thick, thin with alcohol. Give 3 coats of the composi-

tion, allowing each to dry before putting on the next; the first may be of shellac and lampblack alone.

9. To make 1 gal. of the paint for a blackboard, take 10 oz. pulverized and sifted pumice, 6 oz. powdered rottenstone (infusorial silica), ¾ lb. good lampblack, and alcohol enough to form with these a thick paste, which must be well rubbed and ground together. Then dissolve 14 oz. shellac in the remainder of the gal. of alcohol by digestion and agitation, and finally mix this varnish and the paste together. It is applied to the board with a brush, care being taken to keep the paint well stirred, so that the pumice will not settle. Two coats are usually necessary. The first should be allowed to dry thoroughly before the second is put on, the latter being applied so as not to disturb or rub off any portion of the first. One gal. of this paint will ordinarily furnish 2 coats for 60 sq. yd. of blackboard. When the paint is to be put on plastered walls, the wall should be previously coated with glue size—1 lb. glue, 1 gal. water, enough lampblack to color; put on hot.

10. Instead of the alcohol mentioned in 7, take a solution of borax in water; dissolve the shellac in this and color with lampblack.

11. Dilute soda silicate (water glass) with an equal bulk of water, and add sufficient lampblack to color it. The lampblack should be ground with water and a little of the silicate before being added to the rest of the liquid.

Cheap Glossy Black Paint.—Gum amber, 16 oz.; melt in boiling linseed oil, ½ pint; add genuine asphaltum and resin, each 3 oz. Mix thoroughly over a fire, remove to open air and gradually add 1 pt. of oil of turpentine slightly warmed.

Boilers, Paint for.—1 Use asphaltum varnish. There is little or no odor from it when dry.

2. Coal tar and ground graphite thinned with turpentine make an excellent paint for boiler fronts and pipes in boiler room. The steam pipes for heating should not be painted, or if required, should only have a very thin coat of lampblack and linseed oil. Tin is unfit for roofs of boiler houses. Slate is best. You can make a temporary covering on the tin roof with asphalt and gravel. This will not save the tin, which will soon give out entirely. The cheapest way out of your trouble is to take off the tin and slate the roof.

3. Rub it over with a mixture of boiled oil and lampblack. From the latter the grease should be taken before mixing by placing it in a flower pot, the top and bottom sealed with clay and subjected to a good heat.

Branding Paint (Red).—Take of shellac, 2 oz.; borax, 2 oz.; water, 25 oz.; gum arabic, 2 oz. Boil the borax and shellac in water until they are dissolved, add the gum arabic and withdraw from the fire. When the solution has become cold, complete 25 oz. with water and add Venetian red enough to bring it to a suitable consistence and color.

Bronze Paint for Plaster.—Boil 3 lb. pure linseed oil with 12 oz. finely powdered litharge; strain through a coarse canvas cloth and allow to stand until clear; 15 oz. of this soap varnish mixed with 12 oz. metallic soap powder made as follows: To a solution of soda soap in linseed oil, cleared by straining, add a mixture of 4 pt. sulphate of copper solution and 1 pt. sulphate of iron solution, which precipitates a metallic soap of a peculiar bronze hue; wash with cold water, strain and dry to powder) and 5 oz. fine white wax are to be melted together at a gentle heat in a porcelain basin by means of a water bath and allowed to remain for a time in a melted state to expel any moisture that it may contain. It is then applied with a brush to the surface of the plaster, previously heated to 200° F., being careful to lay it on smoothly and without filling up any small indentations of the plaster design. Place it for a few days in a cool place and as soon as the smell of the soap varnish has gone off rub the surface over with cotton wool or fine linen rag, and variegated with a few streaks of metal powder or shell gold. Small objects may be dipped in the melted mixture and exposed to the heat of a fire till thoroughly penetrated and evenly coated with it.

Bronze Paint, for Iron or Brass.—Chrome green, 2 lb.; ivory black, 1 oz.; chrome yellow, 1 oz.; good japan, 1 gill; grind all together and mix with linseed oil.

Antique Bronze.—Sal ammoniac, 2 oz.; cream tartar, 6 oz.; common salt, 12 oz.; dissolve in 2 pt. hot water, then add 4 oz. nitrate of copper dissolved in 1 pt. of water, mix well and apply with a brush several times to the article in a damp situation.

Cheap Paint.—Three hundred parts washed and sieved white sand, 40 parts precipitated chalk, 50 parts rosin and 4 parts linseed oil are mixed and boiled in an iron kettle, and then 1 part oxide copper and 1 part sulphuric acid are added. This mass is supplied with an ordinary paint brush while warm. If it is too thick it is diluted with linseed oil. This paint dries very rapidly, and gets very hard, but protects wood work excellently.—*Corps. Gras. Ind.*

Contrast Colors, for Painting Machinery.—Deep blue and golden brown. Black and warm brown. Chocalate and light blue. Maroon and warm green. Deep red and gray.

Copper Paint.—Precipate metallic copper out of any solution of a copper salt by introducing scrap iron into the liquid. Then mix the precipitated copper with linseed oil or varnish.

Paint, to Destroy.—Mix 1 part by weight of American pearlash with 3 parts quick stone lime by slaking the lime in water, and then adding the pearlash, *making* the mixture about the consistence of paint. Lay the above over the whole of the work required to be cleaned, with an old brush; let it remain fourteen or sixteen hours, when the paint can be easily scraped off.

Distemper for Photographic Backgrounds.—Take whiting, 1½ to 2 lb.; lampblack, 3 oz.; damp blue, 4 oz.; glue, 1½ oz. Dissolve the whiting in 2 qt. water, add nearly all the blue, then add the black, gradually drying after each addition by dipping in it a piece of paper and drying at the fire till you get the exact color required. Then having dissolved the glue in warm water, pour it in; to keep the color from falling off, mix thoroughly together and strain through canvas.

Driers for Paints. See **Driers.**

Economical Paint.—Skim milk, 2 qt.; fresh slaked lime, 8 oz.; linseed oil, 6 oz.; white Burgundy pitch, 2 oz.; Spanish white, 3 lb. The lime to be slaked in water, exposed to the air, and mixed in one-fourth the milk. Dissolve the pitch in the oil and add a little at a time. Then add the rest of the milk and the Spanish white.

Flexible Paints for Oil Cloths.—1. Size with hot soap and alum solutions, used alternately, dry and enamel with colors ground fine in oil with plenty of driers and a little turpentine. Finish with a thin copal varnish if high gloss is desired. Harden by drying at about 200° F.

2. The following retains sufficient flexibility to enable the sheet to be rolled:

Soft soap	2 oz.
Boiling water	12 oz.

Dissolve and work well into usual oil paint, 6 lb.

Coloring Floor Borders.—Use fine umber mixed with oil and a little turpentine.

Glass, Transparent Paint for.—Take for blue pigment, Prussian blue; for red, crimson lake; for yellow, Indian yellow; and for other shades, a mixture of the appropriate primary colors. Rub them in a size made as follows: Venice turpentine, 2 parts; spirits of turpentine, 1 part, and apply with a brush. The colors are moderately fast unless exposed too long to direct sunlight. A solution of the various aniline dyes in shellac varnish has also been recommended.

Gold Paint.—Do not mix the gold size and

powder together, but go over the article to be gilded with the size alone, giving an even and moderate coating. Let it dry, which will not take long, till it is just sticky, or, as gilders call it, tacky. Then over a sheet of smooth writing paper dust on the dry gold powder by means of a stout, soft, sable brush.

Grease Spots to Kill.—Before painting, wash the part with saltpeter, or very thin lime whitewash. If soap suds are used, they must be washed off thoroughly, as they prevent the paint from drying hard.

Iron, Paints for.—1. A good cheap black paint or varnish for iron work is prepared as follows: Clear (solid) wood tar, 10 lb.; lampblack, or mineral black, 1¼ lb.; oil of turpentine, 5½ qt. The tar is first heated in a large iron pot to boiling, or nearly so, and the heat is continued for about 4 hours. The pot is then removed from fire out of doors, and while still warm, not hot, the turpentine mixed with the black is stirred in. If the varnish is too thick to dry quickly, add more turpentine. Benzine can be used instead of turpentine, but the results are not so good. Asphaltum is preferable to the cheap tar.

2. Iron Paint.—The *Photographisches Wochenblatt* mentions that Spangenberger has a paint composed of pulverized iron and linseed oil varnish. It is intended for painting damp walls, kettles, outer walls, or any place or vessel exposed to the action of the open air and weather. Should the article be exposed to frequent changes of temperature, linseed oil varnish and amber varnish should be mixed with the paint intended for the first 2 coats, without the addition of any artificial drying medium. The first coat should be applied rather thin, the second a little thicker, and the last in a rather fluid state. It is not necessary to free iron from rust, grease, etc., by means of acid before applying the paint, as a superficial cleaning is sufficient. The paint is equally adapted as a weather-proof coating for iron, wood and stone.

Lime Paints.—1. For deal floors, wood, stone and brick work. Dissolve 15 dr. good glue by boiling with thickish milk of lime which contains 1 lb. caustic lime. Then add linseed oil, just sufficient to form a soap with the lime. This mixture can be used for making up any color which is not altered by lime. A solution of shellac in borax can be added for brown red or brown yellow colors, and is very suitable in painting deal floors. With a coating of varnish or lake, the substances thus painted assume a fine luster. They can be polished with linseed oil or turpentine.

2. A lime paint which will bear washing: Three parts flint, 3 parts marble fragments and sandstone, 2 parts calcined white china clay, and 2 parts slaked lime, all in powder, furnish a paint to which chosen colors that may be employed with lime are added. This paint, by repeated applications, becomes as hard as stone, without losing porosity.

Luminous Paints and Colors.—The luminous calcic sulphide (also called sulphide of calcium), now obtainable in the market, has a yellowish white tint, which considerably limits its direct application as a paint. On the other hand, the calcic sulphide, or the luminous paint obtained therefrom, loses its luminous property, if it is directly mixed with the ordinary commercial paints. An invention patented by Gustav Schatte, of Dresden, has for its object to produce durable white or colored paints, containing a luminous substance, which causes them to shine in the dark, without changing or neutralizing in daylight the tint of the coloring substance or substances contained in such paints.

Zanzibar or Kauri copal is melted over a charcoal fire. Fifteen parts of the melt are dissolved in 60 parts of French oil of turpentine and the filtered solution is mixed with 25 parts, previously heated and cooled, pure linseed oil. The varnish which is thus obtained is used in the following methods, in the manufacture of luminous paints, by grinding between granite rolls on a paint mill. Iron rolls should be avoided, because particles of iron, which are liable to be detached, would injure the luminous properties.

Varnishes, as they occur in commerce, generally contain lead or manganese, which would destroy the phosphorescence of calcium sulphide.

1. A pure white luminous paint is prepared by mixing 40 parts of the varnish, obtained in the above described process, with 6 parts prepared barium sulphate, 6 parts prepared calcium carbonate, 12 parts prepared white zinc sulphide, and 36 parts good luminous calcium sulphide, in a proper vessel to an emulsion, and then grinding it very fine in a color mill.

2. For red luminous paint, 60 parts varnish are mixed with 8 parts prepared barium sulphate, 2 parts prepared madder lake, 6 parts prepared realgar (red arsenic sulphide) and 30 parts luminous calcium sulphide, and treated the same as for white paint.

3. For orange luminous paint, 46 parts varnish are mixed with 17·5 parts prepared barium sulphate, 1 part prepared Indian yellow, 1·5 parts prepared madder lake and 38 parts luminous calcium sulphide.

4. For yellow luminous paint, 48 parts varnish are mixed with 10 parts prepared barium sulphate, 8 parts barium chromate and 34 parts luminous calcium sulphide.

5. For green luminous paint, 48 parts varnish are mixed with ten parts prepared barium sulphate, 8 parts chromium oxide green, and 34 parts luminous calcium sulphide.

6. A blue luminious paint is prepared from 42 parts varnish, 10·2 parts prepared barium sulphate, 6·4 parts ultramarine blue, 5·4 parts cobalt blue and 46 parts luminous calcium sulphide.

7. A violet luminous paint is made from 42 parts varnish, 10·2 parts prepared barium sulphate, 2·8 parts ultramarine violet, 9 parts cobaltous arsenate and 36 parts luminous calcium sulphide.

8. For gray luminous paint, 45 parts of the varnish are mixed with 6 parts prepared barium sulphate, 6 parts prepared calcium carbonate, 0·5 part ultramarine blue, 6·5 parts gray zinc sulphide.

9. A yellowish brown luminous paint is obtained from 48 parts varnish, 10 parts precipitated barium sulphate, 8 parts auri pigment and 34 parts luminous calcium sulphide.

10. Luminous colors for artists' use are prepared by using pure East India poppy oil, in the same quantity, instead of the varnish, and taking particular pains to grind the materials as fine as possible.

11. For luminous oil color paints, equal quantities of pure linseed oil are used in the place of the varnish. The linseed oil must be cold pressed and thickened by heat. All the above luminous paints can be used in the manufacture of colored papers, etc., if the varnish is altogether omitted, and the dry mixtures are ground to a paste with water.

12. The luminous paints can also be used as wax colors for painting on glass and similar objects, by adding, instead of the varnish, 10% more of Japanese wax and ¼ the quantity of the latter of olive oil. The wax colors prepared in this way may also be used for painting upon porcelain, and are then carefully burned without access of air. Paintings of this kind can also be treated with water glass. The latest use made of luminous paints in England is the painting of harness, which is said to produce quite surprising effects in nocturnal driving.—*Ztschr. Oest. Ap. Ver.*

14. Boil together for an hour 2¼ oz. caustic lime, recently prepared by calcining clean white shells at a strong red heat, with 1 oz. flowers of sulphur and 1 qt. of soft water. Set aside in a covered vessel for a few days, then pour off the

liquid, collect the clear orange colored crystals which have been deposited, and let them drain and dry on bibulous paper. Place the dried sulphide in a clear block lead crucible provided with cover. Heat for half an hour at a temperature just short of redness, then quickly for about fifteen minutes at a white heat. Remove cover and pack in clay until cold. The addition of a small quantity of pure calcium fluoride to the sulphide before heating it is made. It may be mixed with alcoholic copal varnish.

15. Luminous or Phosphorescent Paint for Clock Dials and Other Surfaces.—Heat strontium thiosulphate for fifteen minutes over a good Bunsen gas lamp, and then for five minutes over a blast lamp.

16. Heat equal parts strontium carbonate and lac sulphuris gently for five minutes, then strongly for twenty-five minutes over a Bunsen lamp; then, finally, over a blast lamp for five minutes.

17. Precipitate strong aqueous solution of strontium chloride by means of sulphuric acid; dry the precipitate, and heat it to redness for some time in a current of hydrogen; then over a Bunsen lamp for ten minutes, and for twenty minutes over a blast lamp. Mix any of these with pure melted paraffin for use as a paint, and expose for a time to sunlight. The two former yield a greenish phosphorescence in the dark, the latter a bluish light.

Marine Paint.—For metals in salt water, red lead, 44 parts; quicksilver, 24 parts; thick turpentine, 5¾ parts. Mix to proper consistency with boiled linseed oil. Grind or rub the thick turpentine and quicksilver together until thoroughly amalgamated. Then grind this mixture with the red lead and more boiled oil. Use as little oil as is necessary to make the paint lay on well. A coat of oxide of iron paint may be used first to make the marine paint adhere firmly.

Metals, to Paint.—Paint frequently peels off when exposed to the weather. If the metal is slightly corroded by a solution of copper sulphate slightly acidulated with nitric acid. After standing an hour or so, wash, dry and paint.

Proof against Hot Water.—Clean the metal with turpentine or benzine. Put on two coats of a mixture of white lead, spirits of turpentine and carriage varnish. Follow immediately with a thick coat of carriage varnish and white lead.

Paints, Mixing.—In mixing paints, observe that for outdoor work you must use principally or wholly boiled oil, unless it be for the decorative part of houses, etc.; then mix as for indoor work. For indoor work use linseed oil, turpentine and a little drier, observing that the less oil the less will be the gloss, and that for flatted white, etc., the color being ground in oil, will scarcely require any further addition of that article, as the object is to have it dull. The best driers are ground litharge and sugar of lead; the former for dark and middle tints, and the latter for light ones.

Paint, Mixing Oil Colors.—In mixing different colored paints to produce any desired tint, it is best to have the principal ingredient thick, and add to it the other paints thinner. In the following list of the combinations of colors required to produce a required tint, the first named color is the principal ingredient, and the others follow in the order of their importance. Thus, in mixing a limestone tint, white is the principal ingredient and red the color of which least is needed, etc., the exact proportions of each depending on the shade of color required.

List of compound colors, showing the simple colors which produce them:

Buff—White, yellow ocher, red.
Chestnut—Red, black, yellow.
Chocolate—Raw umber, red, black.
Claret—Red, umber, black.
Copper—Red, yellow, black.
Dove—White, vermilion, blue, yellow.
Drab—White, yellow ocher, red, black.
Fawn—White, yellow, red.
Flesh—White, yellow ocher, vermilion.
Freestone—Red, black, yellow ocher, white.
French Gray—White, Prussian blue, lake.
Gray—White lead, black.
Gold—White, stone ocher, red.
Green Bronze—Chrome, green, black, yellow.
Green Pea—White, chrome green.
Lemon—White, chrome yellow.
Limestone—White, yellow ocher, black, red.
Olive—Yellow, blue, black, white.
Orange—Yellow, red.
Peach—White, vermilion.
Pearl—White, black, blue.
Pink—White, vermilion, lake.
Purple—Violet, with more red and white.
Rose—White, madder lake.
Sandstone—White, yellow ocher, black, red.
Snuff—Yellow, Vandyke brown.
Violet—Red, blue, white.

Durable Paint for Outdoor Work.—Grind powdered charcoal in linseed oil, with sufficient litharge as a drier. Thin for use with boiled linseed oil.

Pottery Paints.—Paints for pottery are divided into: 1. Underglaze, gloss oven colors or couleurs de grand feu, as they are usually labeled.

2. Hard kiln, for medium heat, or couleurs de demigrand feu.

3 Regular kiln or couleurs de mouffle ordinaire. The Lacroix colors are recommended by Janvier.

To make paint stick to bright metal tin roofs, sand paper the metal.

Rubber Paint.—(Matthews.) An extremely endurable paint may be made by first macerating rubber in any of the solvents until of a pasty consistency, next dissolving it in linseed oil heated until the solvent is evaporated, and then mixing in by grinding a proportionate quantity of graphite.

Silicate Paints.—1. When the surface to be painted is of a mineral nature, such as the exterior of a house, the pigments may be mixed with a vehicle consisting chiefly of water glass, or soda or potash silicate. This method of painting requires some care, and a knowledge of the chemical nature of the pigments used. Some colors are completely destroyed by the alkali contained in the water glass. Among those pigments which are not altered by the alkali may be mentioned lime carbonate, baryta white, zinc white, cadmium yellow, Naples yellow, baryta chromate, chrome red, red ultramarine, blue ultramarine, cobalt blue, cobalt green, chrome green, ivory black. When a wall is to be painted, it should first be prepared with a mortar composed of pure fat lime and clean sharp sand. The water used should also be free from saline impurities, as these might subsequently effloresce and destroy the surface of the paint. When the surface of this plaster is dry, a weak solution of water glass should be applied, and the operation repeated several times.

2. Dilute silicate of soda solution until it works well with the brush, and add dry coloring matter, such as will not be decomposed by the chemical. Ochers, Venetian red, smalts, umbers and siennas may be employed.

Skins, Paint, to Remove.—To ¼ lb. of sal soda, add ¼ gal. of rain water. The skins on the top of the paint can be made to be of use again by covering them with this mixture, and allowing them to soak about six days. Those who are doing a heavy business in paints can save many dollars by this easy process. Oil should be added to reduce the mixture to a proper consistence for use.

Smell of Paint, to Remove.—1. Place a vessel of lighted charcoal in the room, and thrown on it 2 or 3 handfuls of juniper berries; shut the windows, the chimney, and the door close; twenty-four hours afterward the room may

be opened, when it will be found that the sickly, unwholesome smell will be entirely gone.

2. Plunge a handful of hay into a pail of water, and let it stand in the room newly painted.

Stacks, Paint for.—1. Dissolve asphaltum in turpentine with the application of a gentle heat. Use when cold. Apply with a brush.

2. Paint the stack with thin coal tar mixed with finely ground plumbago. Make of the consistency of ordinary paint.

Stencil Paints.—Take shellac, 2 oz.; borax, 2 oz.; water, 25 oz.; gum arabic, 2 oz.; lampblack, a sufficiency. Boil the borax and shellac in water till they are dissolved, and withdraw from the fire. When the solution has become cold, complete 25 oz. with water, and add lampblack enough to bring the preparation to a suitable consistence. When it is to be used with a stencil, it must be made thicker than when it is to be applied with a marking brush. The above gives a black ink; for red, substitute Venetian red for lampblack; for blue, ultramarine; and for green, a mixture of ultramarine and chrome yellow.

Stoves, Sample, Paint for.—Paint the stove with paint made of powdered black lead and linseed oil, and polish in the ordinary way when dry. It may be left out in all kinds of weather without injury to the polish.

Transparent Paints.—If in a position to coat the glass before putting in frame, excellent effects may be got by using ordinary shellac varnish, made with bleached shellac, tinted with aniline dye. The glass must be slightly warmed before applying the varnish. Ninety per cent. alcohol should be used for dissolving the shellac and the powdered, not liquid, aniline colors. Sufficient of the color must be added to the varnish to give the required tint. One part of shellac to 8 parts of spirit is a good proportion. Methylated spirit will do. The varnish should be poured on and placed evenly over the glass, not painted on, and the superfluous quantity returned to the bottle.

Tungsten Paints.—The mineral colors from tungsten are obtained by decomposing soluble tungstates by means of salts of the metals yielding insoluble phosphates. The tungstate of nickel produces a light green, tungstate of chromium a dark gray, tungstate of cobalt a violet or indigo blue, and tungstate of barium a bright white color. Tungstic acid alone gives a fine light greenish yellow. All these colors may be employed for water or oil color paints; the last is a really desirable and probably quite unchangeable color.

Vehicle for Color.—One oz. of borax, 2 oz. of shellac, 1 pt. of water. Boil a few minutes, stir with a piece of wood; or 1 oz. of liquid ammonia, 2 oz. shellac, 1 pt. of water. Add more or less shellac, as may be required.

Vessels Paint for, Submarine Works, etc.—Concentrated solution of 160 lb. potash; grape sugar, 80 lb.; add a solution of 320 lb. sulphate of copper. When this solution is heated a precipitate of hydrated oxide of copper is formed; this is filtered, carefully dried, and mixed with 5¼ lb. 75% carbolic acid. Heat the mass and add about 9½ gal. crude linseed oil. When this paint is to be used, reduce with linseed oil. It is said to be poisonous to animal and vegetable bodies depositing themselves on vessels.

Vitrifiable Paints.—The coloring matter is mixed with a flux in such a way that there is no chemical union with it. On heating the flux melts and envelops the coloring matter and glues it firmly to the body of the ware. The following are some of the requisites of a good vitrifiable paint: 1. They must adhere firmly. 2. They must melt at a known temperature. 3. They must undergo no chemical change either from water or the gases of the air. 4. They must have a gloss after being fired; 5. Their contraction and expansion must be the same as the body. Great attention has been paid to the manufacture of these paints in Europe, and these paints possess all the qualities noted above, and they will prove the most economical to use in the end.

Toys, Innoxious Color for Painting.—White fine chalk, 6 parts; calcined magnesia (thoroughly calcined), 3 parts. Add a few drops of indigo solution.

White Oil Paint, Substitute for.—A substitute for white oil paint may be made as follows: Four qt. of skim milk, 1 lb. of fresh slaked lime, 12 oz. of linseed oil, 4 oz. of white Burgundy pitch, 6 lb. of Spanish white, to be mixed as follows: The lime to be slaked in water, exposed to the air, mixed in about ¼ of the milk; the oil, in which the pitch must be previously dissolved, to be added a little at a time, then the rest of the milk, and afterward the Spanish white. This quantity is sufficient for more than fifty square yards covered with two coats.

White Paint for Metallic Surfaces.—Oil paints used on metallic surfaces exposed to heat frequently turn yellow. If instead of oil sodium silicate be used no change of color will be noticed. Zinc white mixed with soluble glass of from 40° to 50° B., to the consistency of ordinary paint, makes an excellent paint for metals.

Window Paint.—Mix with white lead, boiled oil or varnish, and a small quantity of driers (no turps, which hardens for the time, being a volatile oil, and therefore objectionable in this case); paint this over the glass thinly, and stipple it. If you have not a proper brush, make a large pledget of cotton wool or tow, cover it with a clean bit of linen rag, and quickly dab it over the paint.

Golden Yellow.—Mix white with extract of saffron q. s., to give the desired shade. When dry these colors should be coated with a light mastic varnish.

Zinc, to Prepare for Painting.—Dissolve 1 part of chloride of copper, 1 part of nitrate of copper, and 1 part of sal ammoniac, in 64 parts of water, and add 1 part of commercial hydrochloric acid. Brush the zinc over with this, which gives it a deep black; leave to dry twenty-four hours, when any oil color will firmly adhere to it, and withstand both heat and damp.

Paintings, to Clean. See **Cleansing.**

Paintings, Varnishes for. See **Varnishes.**

Palm Oil. See **Oils.**

Panacea.—A term applied by the ancients to those remedies supposed to be capable of curing all diseases. Unfortunately for mankind, no such a medicine exists. The name is still applied to some quack medicines.

Pancreatin, to Prepare.—Cut the fresh pancreas of the pig, free it from all foreign matter and digest in ether, distill the ether from the filtered liquid and the remainder will be the pancreatin.

Paper.—A number of receipts for making paper are given first, followed by receipts for miscellaneous papers.

Selection and Assortment of Rags.—The selection and assortment of the raw material form a very important branch of the paper trade.

Rags are brought to the mill in an unsorted condition, and are called mixed rags.

The system of assorting and classifying rags in common use in this country, and the distinguishing mark given to each sort, cause considerable confusion to the tyro in the trade, and rather retard than facilitate the work of this department, which ought to be conducted on principles readily comprehended and easily impressed upon the memory.

The superiority of the system in vogue on the Continent—its greater simplicity and therefore efficacy, and the great saving of time (a

most important item in the economical working of a factory) effected by it.

The rags are known by number as follows:

No. 1 Rags—White linen without seams, fine. clean.
No. 2 Rags—White linen with seams, fine, clean.
No. 3 Rags—White linen with seams, second quality.
No. 4 Rags—White linen with seams, third quality.

The three last mentioned qualities are easily distinguished, for as the quality deteriorates the rags become thicker, and, the thicker the rags, the greater the quantity of sheive they contain.

No. 5 Rags—Blue linen without seams, first quality.
No. 6 Rags—Blue linen with seams, second quality.
No. 7 Rags—Blue linen with seams, third quality.
No. 8 Rags—Good linen, seconds.
No. 9 Rags—Coarse linen, seconds.
No. 10 Rags—White cotton, fine, first quality.
No. 11 Rags—White cotton, second quality.
No. 12 Rags—Colored cotton, third quality.
No. 13 Rags—Sailcloth without seams, first quality.
No. 14 Rags—Sailcloth with seams, second quality.
No. 15 Rags—Fine hemp bagging, good, clean.
No. 16 Rags—Good hemp bagging.
No. 17 Rags—Hemp rope, fine, clean.
No. 18 Rags—Hemp rope, good, clean.
No. 19 Rags—Hemp rope, free from tar, third quality.
No. 20 Rags—Broke from all the above except the rope.

The simplicity and efficiency of sorting the different rags by this method of numbers are evident; the workpeople having only to know that the higher the number is, the coarser is the quality of the rags. No. 1 is the equivalent for S. P. F. F. F.

Blending or arranging the rags for the different stuffs suitable for the various qualities of paper to be made is a work of considerable difficulty, and requires the greatest care. For example, a paper of a certain quality is desired; the difficulty is to blend that porportion of cotton with linen rags which will produce a paper tough, strong, well sized and possessing those elastic qualities which will permit it to be folded into any shape without showing signs of cracking, as is especially necessary in book papers.

The most convenient, and at the same time most efficacious mode of procedure is to form the various rags into stuffs, such as No. 1 stuff, No. 3 stuff, No. 4 stuff, No. 5 stuff, and stuff specially prepared for tissue and copying papers, composed as follows:

No. 1 Stuff.

No. 2 Rags	1200 lb.
No. 5 Rags	2800 lb.
	4000 lb.

No. 3 Stuff.

No. 4 Rags	400 lb.
No. 6 Rags	1200 lb.
No. 8 Rags	2400 lb.
	4000 lb.

The above No. 1 and No. 3 stuffs are for specially strong papers.

No. 4 Stuff.

No. 7 Rags	1600 lb.
No. 9 Rags	2800 lb.
No. 20 Broke	400 lb.
	4800 lb.

If the broke accummulates, a larger proportion can be used in making colored papers; otherwise the above quantity is sufficient. Rags Nos. 10, 11 and 12 are specially reserved for blending, for thick papers, or for printings of a high class. Nos. 13, 14, 15 and 16 supply the place of any of the numbers for which they are suited. No. 1 can be drawn upon in the event of a special paper being desired.

No. 5 Stuff.

No. 6 Rags	1600 lb.
No. 8 Rags	2400 lb.
	4000 lb.

This No. 5 stuff is principally used for mixing with the rope stuff for tissue and copying papers, in proportions which will be given in the receipts for thin papers.

Rope Stuff.

No. 17 Ropes	2600 lb.
No. 18 Ropes	1200 lb.
No. 19 Ropes	200 lb.
	4000 lb.

It may be mentioned that the qualities of paper on the Continent are known by numbers, No. 1 being the highest quality of writings and printings. The different qualities of paper that can be made from the various stuffs are as follows:

From No. 1 stuff, extra superfine, or No. 1 papers.

From No. 3 stuff, superfine and fine papers.

From No. 4 stuff, fines, fourths and colored papers.

From No. 5 stuff, thin papers; also used for mixing with the rope stuff, for cigarette, copying and tissue papers.

Classification of Home and Foreign Rags.—According to the method generally adopted with their distinguishing names. Superfines, S.P.F. F.F., S.P.F.F., S.P.F., Dark Fines, Gray or Green Linen, New Pieces, Sailcloth, F.F., L.F. X., C.L.F.X., C.C.L.F.X., Fines, Seconds, Thirds, Cords, both dark and light, Outshorts, Prints and the various qualities of hemp and jute bagging.

Superfines consist of superfine new white shirt cuttings.

S.P.F.F.F. consists of extra superfine white linen, first quality.

S.P.F.F. consists of superfine white linen, second quality.

S.P.F. consists of fine white linen, third quality.

Dark Fines consist of fine white cotton rags, well adapted for blotting paper of a good quality.

Green Linen consists of fine unbleached linen cuttings.

New Pieces consist of fine bleached linen cuttings.

Sailcloth consists of canvas (worn) and new cuttings.

F.F. consists of coarse Russian linen rags, first quality.

L.F.X. consists of coarse Russian linen rags, second quality.

C.L.F.X. consists of coarse Russian linen rags, third quality.

C.C.L.F.X. consists of coarse Russian linen rags fourth quality.

Receipts for High Class Papers.—In making papers of superior quality, considerable experience and skill are necessary in selecting and blending the material. The following receipts will produce papers, smooth, strong, tough, and possessing elasticity of feel and clearness of color:

1. Extra Superfine Cream.—For 300 lb. dry paper:

S.P.F.F., ¼; Dark Fines, ¼.
Green linen, ¼; New Pieces, ¼.
4 oz. ultramarine, marked B.B.A.C.
1½ gill cochineal; 40 lb. pearl hardening.

2. Superfine Cream.—For 300 lb. dry paper:
Dark fines, ¼; S.P.F.
Superfines, ¼; Spanish esparto, fine, ¼.
6 oz. ultramarine, B.B.A.C.
1 gill cochineal; 40 lb. pearl hardening.
14 lb. dry starch.

3. Fine Creams.—For 300 lb. dry paper:
Medium Spanish esparto, ¼.
Fines, ¼; F.F., ½.
7 oz. ultramarine, marked B.B.R.V.
1½ gill cochineal.

4. Extra Superfine Commercial Post.—Animal sized.—For 300 lb. dry paper:
S.P.F.F.F., ½; dark fines, ¼.
New pieces, ¼.
3 gal. engine size; 5 lb. pure alum.
5 oz. ultramarine, B.B.A.C.
1 pt. cochineal; ¼ oz. carmine.
40 lb. pearl hardening.

5. Superfine Commercial Post.—Animal Sized.—For 300 lb. dry paper:
S.P.F.F., ½; dark fines, ¼; supers, ¼.
3 gal. engine size; 6 lb. pure alum.
6 oz. ultramarine, B.B.A.C.
1½ gill cochineal; 1 gill archil.
14 lb. starch; 40 lb. pearl hardening.

6. Fine Cream Commercial Post.—Animal Sized.—For 300 lb. dry paper:
F.F. russian rags, ½; seconds, ¼.
No. 2 Spanish esparto, ¼.
6 oz. ultramarine, B.B.R.V.; 1 gill magenta.
6 gal. size; 10 lb. alum.

7. Fourth Creams.—For 300 lb. dry paper:
Second fines, ¼; F.F., ¼.
No. 2 Spanish esparto, ½.
6 pails size; 30 lb. alum.
9 oz. ultramarine, B.B.R.V.; 2 gills archil.

8. Fourth Creams.—For 300 lb. dry paper:
Fine oran esparto, ½.
Tunis esparto, ¼; F. F. rags, ¼.
Nine oz. ultramarine, B.B.R.V.
Two gills magenta; 4 lb. dry starch.

9. Superior Quality of Drawing Cartridge.—No coloring matter:
Cartridge, ½; good canvas, ¼; good seconds, ¼.

10. Extra Superfine Post Paper.—For 300 lb. dry paper:
Supers; ¼; green linen, ¼.
New pieces, ¼; S.P.F.F.F., ¼.
Three oz. ultramarine, A.C.; 2 oz. carmine.

(The above is the highest class of post paper made.)

11. Extra Superfine Blue, High Color.—For 300 lb. dry paper:
S.P.F., ¼; dark fines, ¼.
Fine Spanish esparto, ½.
Nine and a half lb. ultramarine, B.B.R.V.
Half lb. magenta lake.

12. Card Paper, Superfine, Animal Sized.—For 300 lb. dry paper:
S.P.F., ½; fines, ¼; seconds, ¼.
Three oz. ultramarine, B.B.A.C.
One gill archil; 30 lb. pearl hardening.

13. Superfine Cream Envelope Paper, Animal Sized.—For 300 lb. dry paper:
S.P.F., ½; seconds, ¼; new pieces, ¼.
Three oz. ultramarine, B.B.A.C.
One and a half pt. cochineal; 12 lb. starch.

14. Superfine High Blue.—For 300 lb. dry paper:
S.P.F., ¼; medium Spanish esparto, ½.
Scotch fines, ¼.
Twelve lb. ulramarine, marked A.
Three-quarter lb. magenta lake.

15. Fine High Blue.—For 300 lb. dry paper:
F.F., ½; fine Oran esparto, ½.
Eight lb. ultramarine, marked B.B.R.V.
Half lb. magenta lake.

Colored Papers.—16. Deep Lilac.—For 250 lb. dry paper:
No. 3 stuff; 5 pails size; 20 lb. alum.
Thirty oz. violet methyl, marked B.B.B.
Half oz. eosine, marked A.

17. Deep Green.—For 250 lb. dry paper:
No. 3 stuff; 5 pails size; 20 lb. alum.
Twenty-two lb. silk green paste, extra fine.
(This is a beautiful clear green.)

18. Deep Lilac.—For 250 lb. dry paper:
No. 4 stuff; 20 lb. alum; 4 pails size.
Eight oz. diamond fuchsine; 3 oz. aniline blue.
Fifty lb. straw pulp.

19. Pale Green.—For 250 lb. dry paper:
No. 4 stuff, full bleached: 4 pails size; 20 lb. alum.
Three-quarter lb. bichromate, ten minutes later.
Two and one-quarter lb. sugar of lead, ten minutes later.
Fifteen oz. Paris blue, dissolved in hot water, adding ½ gill of sulphuric acid.

20. Green, Medium Deep Shade.—For 250 lb. dry paper:
No. 4 stuff; 60 lb. mechanical wood pulp; 5 pails size.
Twenty lb. alum; 2½ lb. bichromate, fifteen minutes later.
Six lb. sugar of lead, fifteen minutes later; 1½ lb. Paris blue.

21. Green.—For 250 lb. dry paper:
No. 4 stuff; 60 lb. mechanical wood pulp.
Two and one-half lb. bichromate, fifteen minutes later.
Six lb. sugar of lead, fifteen minutes later.
Seven oz. Paris blue; 4 pails size; 15 lb. alum.

22. Pale Green.—For 250 lb. dry paper:
No. 4 stuff, full bleached; 60 lb. wood pulp.
Three oz. bichromate; 6 oz sugar of lead.
Four pails size; 15 lb. alum; 3 lb. Paris blue.

23. Green, Deep Clear Tint.—For 250 lb. dry paper:
No. 3 stuff; 1½ lb. bichromate.
Three lb. sugar of lead, fifteen minutes later.
Two lb. Paris blue, ten minutes later.
Five pails size; 20 lb. alum.

24. Deep Orange.—For 250 lb. dry paper:
No. 4 stuff; 40 lb. wood pulp; 4 pails size.
Twenty lb. alum; 6 lb. bichromate; 18 lb. sugar of lead.
Twenty-five lb. Venetian red; 50 lb. straw pulp.

25. Skin Color.—For 250 lb. dry paper:
No. 4 stuff; 60 lb. wood pulp; 4 pails size.
Twenty lb. alum; 9¼ lb. green copperas.
Ten and one-half lb. crystal soda; 8 oz. bichromate.
One and one-half lb. sugar of lead,

26. Deep Olive.—For 250 lb. dry paper:
No. 4 stuff; 60 lb. wood pulp; 4 pails size.
Fifteen lb alum; 2 lb. green copperas.
Two lb. crystal soda; 2¼ lb. Venetian red.

27. Buff.—For 250 lb. dry paper:
No. 4 stuff; 60 lb. yellow wood.
Four pails size; 20 lb. alum; 13 lb. yellow ocher.
Ten oz. Venetian red; 1 gill Brazil wood dye.

28. Nankeen Tissue.—For 200 lb. dry paper:
Nos. 17 and 18 rope stuffs, ½; canvas, ½.
Three lb. potash; 3 lb. green copperas.
Two lb. crystal soda.

29. Lilac Tissue, Deep Shade.—For 200 lb. dry paper:
Nos. 17 and 18 rope stuffs, ½; No. 5 stuff, ½.
Eight oz. aniline blue; 3 oz. diamond fuchine.
Two oz. violet methyl, R.R.R.R. brand.

30. White Tissue.—For 200 lb. dry paper:

Nos. 17 and 18 rope stuffs, ½; No. 5 stuff, ½.
Five oz. ultramarine, B.B.A.C.; 2 gills Brazil wood dye.

31. Blue Tissue.—For 200 lb. dry paper:

Rope stuff, ½; good sailcloth, ½.
Two lb. ultramarine, B.B.A.C.; 5 gills Brazil wood dye.

32. Fine Gray Writings.—For 250 lb. dry paper:

No. 4 stuff, full bleached; 6 pails size.
Twenty-five lb. alum, 12 oz. bichromate, 2 lb. sugar of lead, to be dissolved together in one pail, and put into the engine while hot.
Three oz. Paris blue, half an hour later.
Four oz. logwood extract.

33. Fine Gray Writings.—For 250 lb. dry paper:

No. 4 stuff, full bleached; 6 pails size.
Twenty-five lb. alum; 15 oz. bichromate; 2½ lb. sugar of lead.
Six oz. Paris blue, half an hour later.
Seven oz. logwood extract.

34. Fine Gray Writings.—For 250 lb. dry paper:

No. 4 stuff, full bleached.
Three lb. ultramarine, B.B.R.V.; 2 lb. Venetian red.
Four lb. yellow ocher; 6 pails size; 20 lb. alum.

35. Superfine Gray Writings.—For 250 lb. dry paper:

No. 3 stuff, full bleached.
Four lb. ultramarine, B.B.A.C.; 1 lb. bichromate;
One and a half lb. sugar of lead; 3 lb. Venetian red.
Six pails size; 25 lb. alum.

36. Catechu Brown Wrapping.—For 250 lb. dry paper:

Hemp bagging, ½; No. 4 stuff, ½.
Seven pails catechu; 5 pails size; 15 lb. alum.
Three lb. bichromate.

37. Catechu Brown, Deep Color.—For 150 lb. Dry Paper:

No. 4 stuff, unbleached; 3 pails size; 10 lb. alum.
Three pails catechu; 2 lb. green copperas.
Three lb. bichromate.

38. Aniline Blue, Deep Shade.—For 250 lb. dry paper:

No. 4 stuff, full bleached; 5 pails size; 20 lb. alum.
Four oz. aniline blue; ½ oz. diamond fuchine.

39. Aniline Blue.—For 250 lb. Paper:

No. 4 stuff, full bleached; 5 pails size; 15 lb. alum.
Three oz. aniline blue; ½ oz. diamond fuchine.

40. Aniline Blue, Deep Color.—For 250 lb. dry paper:

No. 4 stuff, full bleached; 4 pails size.
Fifteen lb. alum; 2 oz. aniline blue.
One-sixth oz. diamond fuchine; 6 oz. Berlin blue.

41. Lilac.—For 250 lb. dry paper:

No. 4 stuff, full bleached; 5 pails size; 20 lb. alum.
Three oz. aniline blue; ½ oz. diamond fuchine.

42. Deep Lilac.—For 250 lb. dry paper:

No. 4 stuff, full bleached; 5 pails size; 20 lb. alum.
Four oz. aniline blue; 1 oz. diamond fuchine.

43. Deep Aniline Blue.—For 250 lb. dry paper:

No. 3 stuff, full bleached; 6 pails size; 20 lb. alum.
Four and one half oz. aniline blue; ⅛ oz. diamond fuchine.

44. Deep Lilac.—For 250 lb. dry paper:

Nos. 3 and 4 stuffs, half and half; 4 pails size.
Fifteen lb. alum; 2 oz. aniline blue.
Two oz. diamond fuchine; 3½ oz. Paris blue.

45. Berlin Blue.—For 250 lb. dry paper:

No. 4 stuff, half bleached; 5 pails size.
Twenty lb. alum; ½ oz. fuchine; 5 lb. Paris blue.

46. Deep Aniline Blue.—For 250 lb. dry paper:

No. 4 stuff, full bleached; 5 pails size.
Twenty lb. alum; 9 lb. Paris blue.
Three and one-half oz. aniline blue; 3 oz. diamond fuchine.
(The above blue presents a fine clear color, very deep and uniform.)

47. Venetian Red.—For 250 lb. dry paper:

No. 3 stuff, unbleached; 50 lb. chemical wood pulp.
Four pails size; 15 lb. alum; 60 lb. Venetian red.
Three pts. Brazil wood dye.

48. Fine Yellow Printings.—For 200 lb. dry paper:

Spanish esparto, ½; Oran esparto, ½.
Two lb. bichromate; 4 lb. sugar of lead.
Three pails size; 10 lb. alum.

49. Deep Venetian Red.—For 200 lb. dry paper:

No. 4 stuff, unbleached; 5 pails size.
Twenty lb. alum; 2½ lb. yellow ocher.
Fifty lb. Venetian red; 3 pt. Brazil wood dye.

50. Pink.—For 250 lb. dry paper:

No. 4 stuff; 5 pails size; 20 lb. alum.
Three oz. diamond fuchine, dissolved in 300 oz. of boiling water, and strained through a fine flannel or silk bag.

51. Deep Eosine Pink.—For 250 lb. dry paper:

No. 3 stuff; 5 pails size; 20 lb. alum.
Twelve oz. eosine, marked B. N., dissolved in boiling water, and strained through a flannel bag into the engine.

52. Pale Eosine Pink.—For 250 lb. dry paper:

No. 3 stuff; 5 pails size; 20 lb. alum.
Three oz. eosine, marked B. N.
One-half oz. violet methyl. Strain into the engine.

53. Eosine A, Deep Pink to Blood Red.—For 250 lb. dry paper:

No. 3 stuff, full bleached.
Thirteen oz. eosine, marked A; ½ oz. violet methyl.
(This is a deep pink of a beautiful shade.)

54. Yellow Wrapping for Post Paper.—For 250 lb. dry paper:

No. 4 stuff; 60 lb. mechanical wood pulp.
Two lb. bichromate of potash, fifteen minutes later.
Four lb. sugar of lead; 20 lb. alum; 4 pails size.
Fifty lb. straw pulp, by Lahosse's system.

55. Yellow Printings.—For 250 lb. dry paper:

No. 4 stuff, half bleached.
Fifty lb. mechanical wood pulp.
One and a quarter lb. bichromate, twenty minutes later.
Three-quarter lb. sugar of lead, half an hour later.
Fifteen lb. alum; 3 pails size; 50 lb. straw pulp.

56.—Yellow.—For 250 lb. dry paper:

No. 4 stuff; 4 lb. bichromate, twenty minutes later.
Eight lb. sugar of lead, half an hour later.
Twenty lb. alum; 6 pails size; 40 lb. straw pulp.

57. Yellow.—For 250 lb. dry paper:

No. 4 stuff; 20 lb. mechanical wood pulp.
Two and a quarter lb. bichromate, twenty minutes later.
Seven and a half lb. sugar of lead, half an hour later.
Twenty lb. alum; 4 pails size.

58. Yellow,—For 250 lb. dry paper:

No. 4 stuff; 40 lb mechanical wood pulp.
Fifteen lb. alum; 4 pails size; 5 lb. bichromate.
Eight lb. sugar of lead.

59. Yellow.—For 250 lb. dry paper:

No. 4 stuff; 15 lb. alum; 4 pails size.
One and one-fourth lb. bichromate; 5 lb. sugar of lead.

60. Yellow.—For 250 lb. dry paper;

No. 4 stuff; 40 lb. mechanical wood pulp.
Fifteen lb. alum; 4 pails size; 5 lb. bichromate.
Eleven lb. sugar of lead.

61. Yellow Printings.—For 450 lb. dry paper:

Tunis esparto, ½; No. 2 Spanish esparto, ½.
Twenty lb. French ocher; 4 lb. dark English ocher.
Eight lb. sugar of lead; 4½ lb. bichromate.
Two lb. red chrome.

62. Yellow Printings.—For 450 lb. dry paper:

Tunis esparto, ½; Oran esparto, ½.
Three and one-half lb. bichromate; 7 lb. sugar of lead.

63. Catechu Brown.—For 250 lb. dry paper:

No. 4 stuff, unbleached; 4 pails size.
Twenty lb. alum; 12 pails catechu.
Six lb. bichromate; 3 lb. crystal soda.

64. Catechu Brown.—For 250 lb. dry paper:

No. 4 stuff, half bleached; 4 pails size.
Four pails catechu; 20 lb. alum; 1½ lb. bichromate.

65. Catechu Brown.—For 250 lb. dry paper:

No. stuff, full bleached; 4½ lb. green copperas.
Four pails size; 3 pails catechu; 20 lb. alum.
Three and one-half lb. bichromate.

66. Orange.—For 200 lb. dry paper:

No. 4 stuff; 50 lb. yellow mechanical wood pulp.
Twenty lb. orange mineral; 1½ lb. Venetian red.
Four pails size; 20 lb. alum.
(The orange and the Venetian red must be carefully strained through a fine wire or flannel bag.)

67. Orange.—For 250 lb. dry paper:

No. 4 stuff; 60 lb. mechanical wood pulp.
Fifteen lb. alum; 4 pails size; 30 lb. orange mineral.

68. Orange.—For 250 lb. dry paper:

No. 4 stuff; 60 lb. mechanical wood pulp.
Fifteen lb. alum; 4 pails size; 15 lb. orange mineral.
One lb. Venetian red.

69. Orange.—For 250 lb. dry paper:

No. 4 stuff; 50 lb. mechanical wood pulp.
Twelve lb. orange mineral; 15 lb. alum; 4 pails size.

70. Orange.—For 250 lb. dry paper:

No. 4 stuff, only half bleached or gas bleached, and not potched.
Three pails size; 15 lb. alum; 6 lb. bichromate.
Eight lb. sugar of lead; 60 lb. superfine orange.

71. Venetian Red.—For 250 lb. dry paper:

No. 4 stuff, half bleached; 2½ lb. yellow ocher.
Forty-five lb. Venetian red; 20 lb. alum; 5 pails size.

72. Orange Yellow.—For 250 lb. dry paper:

No. 4 stuff, 40 lb. mechanical wood pulp.
Three pails size; 15 lb. alum; 6 lb. bichromate.
Eight lb. sugar of lead; 25 lb. Venetian red.
Fifty lb. straw pulp.

73. Yellow Wrapping.—For 250 lb. dry paper:

No. 4 stuff, unbleached.
Fifty lb. wood pulp, No. 2 quality; 4 pails size.
Twenty lb. alum; 16½ lb. sugar of lead, brown.
Eight lb. bichromate; 20 lb. Venetian red.

74. Yellow Ocher, for Wrapping.—For 250 lb. dry paper:

No. 4 stuff, unbleached.
Sixty lb. wood pulp, No. 2 quality; 4 pails size.
Fifteen lb. alum; 20 lb. yellow ocher.
Five oz. Venetian red; 4 oz. magenta lake.

75. Pale Orange.—For 250 lb. dry paper:

No. 4 stuff; 40 lb. wood pulp; 4 pails size.
Fifteen lb. alum; 15 lb. superfine orange.

76. Gray.—For 250 lb. dry paper:

No. 4 stuff, half bleached; 4 pails size.
Twenty lb. alum; 3 lb. green copperas.
Three lb. crystal soda; 4 lb. yellow ocher, dark.
Four lb. yellow ocher, light; 5 oz. Venetian red.

77. Venetian Red.—For 250 lb. dry paper.

No. 4 stuff; 40 lb. yellow wood pulp.
Four pails size; 15 lb. alum; 48 lb. yellow ocher.
Fifty lb. venetian red.
(This is a beautiful deep Venetian red, principally used for the covers of serials.)

78. Fawn.—For 250 lb. dry paper:

No. 4 stuff; 4 pails size; 20 lb. alum.
Two lb. green copperas; 2 lb. crystal soda.
One and a half lb. Venetian red.

79. Fawn.—For 250 lb. dry paper:

No. 4 stuff; 20 lb. chemical wood pulp.
Five oz. ultramarine; 1 lb. Venetian red.
Four lb. yellow ocher, French.

80. Deep Paris Blue.—For 250 lb. dry paper:

No. 4 stuff, half bleached; 4 pails size.
Twenty lb. alum; 2 lb. logwood extract.
Six lb. Berlin or Paris blue; 2 pints cochineal.

81. Saturnine Red.—For 250 lb. dry paper:

No. 3 stuff; 4 pails size; 20 lb. alum.
Fifty lb. saturnine red; 5 lb. superfine orange.

82. Chrome Orange.—For 300 lb. dry paper:

No. 1 stuff, full bleached; 25 lb. alum.
Six pails size; 56 lb chrome orange paste, No. 1.
(This is a fine clear orange for a good quality of paper.)

83. Soluble Brown.—For 250 lb. dry paper:

No. 4 stuff, half bleached; 5 pails size.
Twenty lb. alum; 15 lb. soluble brown.
(This coloring matter must be carefully strained into the engine. It is the best substitute for catechu dyed papers, and has all the characteristics of catechu, and also the advantage of being much cheaper.)

84. Violet, Deep Shade.—For 250 lb. dry paper:

No. 3 stuff, full bleached; 25 lb. alum.
Five pails size; 6 lb. violet methyl, marked R. R. R. R.
Three oz. blue methyl.

Colored Esparto Papers.—

85. Dark Yellow.—For 400 lb. dry paper:

Fourteen lb. bichromate of potash.
One and three-quarters lb. sugar of lead, dissolved in 1 pail of hot water; strain into the engine through a flannel bag.
Two and one-half lb. green copperas, one hour later; 25 lb. alum.

86. Orange Yellow.—For 400 lb. dry paper:

Oran esparto; 7½ lb. bichromate.
Fifteen lb. brown sugar of lead, dissolved in 5 pails of hot water; strain through a flannel bag.
One quarter lb. Venetian red; 25 lb. alum; 7 pails size.

87. Fine Deep Blue.—For 400 lb. dry paper:

Oran esparto; 1 lb. crystal soda.
Ten lb. prussiate of potash.
Three lb. green copperas, dissolved in 4 pails of hot water.
Four qt. iron liquor.
One oz. magneta, dissolved in one pail of hot water.
Twenty-five lb. alum.

88. Chocolate Brown.—For 400 lb. dry paper:
Four hundred lb. Oran esparto; 37 lb. Venetian red.
Three lb. catechu; 5 lb. bluestone; 5 lb. green copperas.
Four lb. ultramarine; all one hour apart.
Twenty lb. alum; 7 pails size.

89. Fine Rose Tint.—For 400 lb. dry paper:
Medium Spanish esparto, ½; good Oran esparto, ½.
Two oz. eosine, marked A, dissolved in one pail of boiling water, and strained through a flannel bag.

90. Rose Tint.—For 400 lb. dry paper:
Four hundred lb. Oran esparto, 14 lb. Venetian red.
One lb. chrome yellow; 20 lb. alum.

91. Straw Tint.—For 400 lb. dry paper:
Four hundred lb. Oran esparto; 1½ lb. bichromate of potash.
Three lb. white sugar of lead, dissolved in one pail of hot water.
Quarter lb. ultramarine; 1½ pt. iron liquor.

92. Amber.—For 400 lb. dry paper:
Four hundred lb. Oran esparto.
Half lb. chrome yellow, mixed in the engine one hour.
One pt. iron liquor; 20 lb. alum; 6 pails size.

93. Light Buff.—For 400 lb. dry paper:
Four hundred lb. Oran esparto; 4 lb. green copperas.
Four oz. sugar of lead; 3 lb. bichromate of potash.
Fifteen lb. alum; 5 pails size.

94. Orange Buff.—For 400 lb. dry paper:
Four hundred lb. Oran esparto; 6 lb. bichromate of potash.
Eight lb. sugar of lead; 14 lb. Venetian red.
Twenty lb. alum; 6 pails size.

95. Fine Amber Writings.—For 300 lb. dry paper:
Medium Spanish esparto, ½; F. F. rags, ¼; thirds, ¼.
Six and a half oz. nitrate of lead; 3 oz. bichromate of potash.
Eleven oz. Venetian red, strained through a silk bag.
Thirty lb. alum; 8 pails size.
—*Practical Papermaker.*

American Combinations for Coloring.—Hofmann gives the following examples of the combinations of colors which have been adopted by American manufacturers:

1. Yellow gold envelope of fine quality is made of bichromate of potash, 10 lb.; nitrate of lead, 18 lb.; orange mineral, 56 lb.; porous alum, 30 lb.; each substance being separately dissolved and added to 400 lb. pulp.

2. Orange red gold envelope.—Bichromate of potash, 7 lb.; nitrate of lead, 10½ lb.; orange mineral, 60 lb.; porous alum, 20 lb. Those substances are dissolved separately and added to 400 lb. of pulp.

3. Buff envelope of fine deep shade is made from bichromate of potash, 3 lb.; nitrate of lead, 5 lb.; orange mineral, 10 lb.; American ocher, 20 lb.; porous alum, 30 lb.; some half stuff of red jute bagging; for 400 lb. of pulp.

4. Tea color is made from a decoction of quercitron bark, the liquid being poured into the engine, and 2 lb. of copperas in solution are added for every gallon of the bark extract. A little ultramarine may be used to brighten the color.

5. Drab.—Venetian red, well washed, added to a pulp of tea color made as above will give a fine drab.

6. Brown.—Is composed of several colors, or a very fine dark green tea color brown, containing tea, buff, drab and ink gray, may be made of: Quercitron bark, liquid, 15 gal.; bicarbonate of soda, 2 lb.; Venetian red, 4 lb.; extract of nutgalls, 2½ lb.; copperas, 18 lb.; porous alum, 30 lb. The above proportions are for 400 lb. of pulp.

Miscellaneous Papers.—Adhesive Paper.—Use a good quality of mucilage (see Mucilages) and paint the paper, which should be stretched with this, and when dry cut up for use. Paper may be gummed on both sides; affords a very convenient mode of mounting pictures, etc.

Paper, to Bronze. See **Bronzing.**

Paper Bowls, to Make.—Get a block of wood turned to the size and shape of your bowls, and with a stem to serve as a mount. This must be well covered with French chalk. Take your sheets of paper, well wetted, paste them and mould round the block one after the other until requisite thickness is obtained. You cannot easily reduce the paper to pulp, and if you did you would then want hydraulic pressure to mould the bowls.

Paper Canoes.—Sheets of stout manila passed through a hot bath of aqueous solution of zinc chloride, at 75° B., pressed strongly together and then soaked in dilute aqueous soda solution containing a small amount of glycerine, cohere to form a strong, stiff, waterproof board admirably adapted to the construction of small boats. Single sheets of paper passed quickly through the zinc chloride bath, pressed and washed and dried, are waterproof, and may be otherwise joined to form waterproof boards by any suitable cement.

Carbolic Acid Paper.—1. Paraffine, 9 parts; carbolic acid, 3 parts; stearine, 7½ parts. Melt and apply with a brush to the paper. It is used for disinfecting purposes.

2. Melt 5 parts of stearine at a gentle heat, and stir in 2 parts of carbolic acid; then add 5 parts of melted paraffine and stir the whole well together until cold. When required for use melt the mixture over a water bath and brush it over the surface of the paper with a soft brush.

Carbon Paper.—Melt 10 parts lard, 1 part of wax and mix with a sufficient quantity of fine lampblack. Saturate unglazed paper with this, remove excess and press.

Charred Paper, to Preserve.—Collodion is poured over the charred paper. In a few minutes this dries, and a tough transparent coating is produced, through which the printing, etc., can be seen. Bank notes and other documents charred by fire have been thus successfully treated.—*Scient. Amer.*

Paper Chemically Prepared.—1. Chemically prepared paper for autographic and automatic telegraphy is prepared by soaking it in either of the following solutions: Nitrate of ammonia, 2 lb.; ferricyanide of potassium, ½ oz.; gum tragacanth, 2 oz.; glycerine, 2 oz.; water, ½ gal. Or, iodide of potassium, ¼ lb.; bromide of potassium, 1 lb.; starch, ½ oz.; water, 2 qt.

2.

Iodide potassium	½	lb.
Bromide potassium	2	lb.
Dextrine or starch	1	oz.
Distilled water	1	gal.

Paper, to Clean. See **Cleansing.**

Copying Paper.—The following is communicated to the *Polytechn. Notizblatt* by E. Dieterich, in regard to the method he employs for making the copying paper which has obtained so good a reputation in Germany: The manufacture may be divided into two parts, viz., the production of the color and the application of the same to the paper. For blue paper, Dieterich uses exclusively the blue color known as Paris blue, as covering better than any other mineral color. Ten kgs. of the same are coarsely ground and mixed with 20 kgs. of ordinary olive oil; 0·25 kg. of glycerine is then added. This mixture is for a week exposed in a drying room to a temperature of 40° to 50° C., and then ground as fine as possible in a paint mill. The glycerine softens the hard paint, and tends to make it more easily diffusible.

Then Dieterich melted 0·5 kg. of yellow wax

with 7·5 kgs. of ligroine, and added to 3 kgs. of the blue mixture, mixing slowly at a temperature of 30° or 40° C. The mass is now of the consistency of honey. It is applied to the paper with a coarse brush, and afterward evenly divided and polished with a badger's hair brush. The sheets are then dried on a table heated by steam. This is done in a few minutes, and the paper is then ready for shipment. The quantities mentioned will be sufficient for about 1,000 sheets of 50x90 centimeters, being a day's work for two girls. For black paper aniline black is used in the same proportion. The operation must be carried on in a well ventilated room protected from fire, on account of the combustibility of the material and the narcotic effects of the ligroine. The paper is used by being placed between two sheets of paper, the upper one receiving the original, the lower one the copy.

Cork Paper.—A paper under this title has been patented in the United States; it is prepared by coating one side of a thick, soft, and flexible paper, with a mixture composed of glue, 20 parts; gelatine, 1 part, and molasses, 3 parts, and afterward covering with finely powdered cork, which is afterward lightly rolled in. This paper is largely used to pack bottles.

Paper for Draughtsmen.—Water, 15 parts; powdered tragacanth, 1½ parts. Dissolve and strain through gauze. Stretch the paper on a board. Apply the mixture smoothly to it. The paper thus treated will take either oil or water colors.

To Take Creases Out of Drawing Paper or Drawings.—Place the drawing face downward on a sheet of smooth white paper; cover with another sheet slightly dampened. Iron with an iron moderately warm. Engravings may be treated in the same way.

Emery Paper.—Apply a thin coating of glue to paper which has been treated with a thin coating of glue. Sift the emery on according to its fineness.

Solid Emery Paper.—Emery paper is frequently found lacking in retaining an equal efficiency, the fresh parts biting too much, and the paper getting soon worn through in many places. Emery has been tried on linen, but with little success. A paper or board has been recommended in which emery enters as a constituent part. It is advised to employ fine and uniform cardboard pulp, with from one-third to half its weight of emery powder thoroughly mixed with it, so that the emery may be equally distributed. The mass should be poured out into cakes of from 1 to 10 in. in thickness. They must not be pressed hard. Such a paper, it is said, will adapt itself to the form of the articles and will serve until completely worn out.

Enamel for Fine Cards.—For white and all delicate shades.—Paraffin by weight, 15 parts; pure kaolin (china clay), 62½ parts. The kaolin should be very dry, and reduced to a powder. Mix with the paraffin, after the latter has been heated to the fusing point. Let the mixture cool, then reduce to powder. When used, make into a paste in a paint mill, with warm water. Color as desired.

Enameled Paper. — Various metallic pigments are employed, such as will spread smoothly and take a polish. The pigments are white lead, oxide of zinc, sulphate of barytes, China clay, whiting, chalk, in a menstruum or upon a previous coating of glycerine, size, collodion, water, varnish, etc., afterward polished by an agate or between calendering or burnishing cylinders.—*Glassware Reporter.*

Paper, to Fireproof. See **Fireproofing.**

To Render Paper Inflammable When Thrown on the Ground.—Saturate the paper with a solution of phosphorous in ethylic ether or carbon disulphide. The solvent on evaporation leaves the phosphorus in a finely divided condition and spontaneously inflammable.

Fly Paper Free from Poison.—Half lb. quassia wood; 1 qt. water. Pour the water over the wood and allow it to stand overnight. Strain and boil the liquid down to 1 pt. Boil the wood again with 1 pt. water until ½ pt. remains. Mix the two infusions, add ¼ lb. sugar. When the sugar has dissolved pass the paper through the liquid, drain and dry.

Fly Paper.—1. Oil the paper and coat with turpentine varnish.

2. Cobalt Fly Paper.—Vomacka gives the following:

Quassia chips	150 parts.
Chloride of cobalt	10 parts.
Tartar emetic	2 parts.
Tincture of long pepper (1 to 4 of proof spirit)	80 parts.
Water	400 parts.

3. Powdered black pepper is mixed with sirup to a thick paste, which is spread by means of a broad brush upon coarse blotting paper. Common brown sirup will answer, but sirup made from sugar is preferable, as it dries quicker. For use a piece of this paper is laid upon a plate and dampened with water. The paper may also be made directly at the mill by adding sugar to the pulp and afterwards ¼ to ⅛ of powdered black pepper and rapidly working it into a porous absorbent paper.

4 To 1 lb. resin add 2 fl. drm. linseed oil. While the mixture is warm, spread it on foolscap paper.

5. Make a solution of 2 parts arseniate of potassium or arseniate of sodium, 4 parts white sugar, 40 parts water. Saturate stout unsized paper in this solution, then dry. To use the paper, moisten it with water, and place in saucers. Great care should be taken with this paper, as it is poisonous.

6. Melt resin and add thereto, while soft, sufficient sweet oil, lard, or lamp oil to make it, when cold, about the consistency of honey. Spread on writing paper, and place in a convenient spot. It will soon be filled with ants, flies, and other vermin.

7. Boiled linseed oil and resin; melt and add honey. Soak the paper in a strong solution of alum and then dry before applying the above.

8. Sticky fly paper may be coated with one of the following mixtures: Resin, 9 parts; rapeseed oil, 4 parts.

9. Resin, 8 parts; turpentine, 4 parts; rapeseed oil, 4 parts; honey, ½ part.

10. Resin, 1 lb.; molasses, 3½ oz.; linseed oil, 3½ oz. Boil until thick enough.

Fumigating Paper.—Apply to bibulous paper a strong ethereal or alcoholic solution of benzoin, tolu, storax, olibanum or labdanum. To burn well the paper should first be impregnated with an aqueous solution of saltpeter and dried.

Stains for Glazed Papers.—Glue is used in lieu of the more expensive gums on account of the cheapness of these papers. One lb. of glue dissolved in 1¼ gal. water. The proportions of coloring materials are given for 1 ream of paper of medium weight and size.

Black.—1. Dissolve 1 lb. of glue in 1¼ gal. triturate, this with lampblack, 1 lb., previously rubbed up in rye whisky; Frankfort black, 2¾ lb.; Paris blue, 2 oz.; wax soap, 1 oz.; then add liquor of logwood, 1½ lb.

2. One and a half gal. of liquor of logwood, compounded with sulphate of iron, 1 oz. of wax soap, 4½ oz. of gum arabic.

Blue (azure).—One and a quarter gal. of glue liquor as before, mixed with 1½ lb. Berlin blue, 2¾ lb. powdered chalk, 2¼ oz. light mineral blue, 2 oz. wax soap.

Blue (dark).—Mix with 1¼ gal. of glue liquor 4½ lb. powdered chalk, 4½ oz. Paris blue, 2 oz. of wax soap.

Blue (pale).—1. Mix ½ gal. of tincture of Berlin blue and 1 oz. wax soap with 3½ oz. of solution of gum tragacanth.

2. Take 1½ gal. of glue liquor and mix with 4 lb. of powdered chalk and 2 oz. each of Paris blue and wax soap.

The pulp should always be colored before it is sized, except in cases where the alum or resin soap would injure the colors or be injured by them.

Brown (dark).—1. One and a half gal. of glue liquor, mixed with 6 lb. each of colcothar (jeweler's rouge) and English pink, 1½ lb. of powdered chalk, 2 oz. wax soap.

2. Dissolve 1 oz. wax soap and 4½ oz. gum arabic in ½ gal. of good Brazil wood liquor, and add a like quantity of tincture of gall nuts.

Green (copper).—Mix in 1¼ gal. of glue liquor 4 lb. of English verdigris, 1½ lb. powdered chalk, and 4 oz. wax soap.

Green (pale).—Mix with 1¼ gal. glue liquor 1 lb. Bremen blue, 8½ oz. whiting, 1 oz. pale chrome yellow, and 2 oz. wax soap.

Lemon Color.—Mix in 1¼ gal. glue liquor 13 oz. lemon chrome, 2 lb. powdered chalk, and 2 oz. of wax soap.

Orange Yellow.—Mix in 1¼ gal. glue liquor, 2 lb. lemon chrome, 1 lb. Turkish minium, 2 lb. white lead, and 2 oz. wax soap.

Red (cherry).—Mix in 1¼ gal. glue liquor 8½ lb. of Turkey red, previously mixed up with ¼ gal. of Brazil wood liquor, and 2 oz. wax soap.

Red (dark).—Mix ¾ gal. of Brazil wood liquor with 1 oz. wax soap, and 4½ oz. gum arabic.

Red (pale).—To 1½ gal. of glue liquor add 8¼ lb. of Turkey red, previously rubbed up with 2 oz. of wax soap.

Violet.—Four and a half oz. gum arabic and 1 oz. wax soap are to be mixed with ½ gal. of good logwood liquor. When the gum is dissolved, mix with it enough potash to form a mordant.

Stains for Morocco Papers.—For one ream of paper of medium size and weight the following receipts are recommended:

Black.—Dissolve 8¾ oz. of good parchment shavings in 1½ gal. water; stir into this liquid 1 lb. lampblack, 3 lb. Frankfort black and 1¾ oz. Paris blue.

Blue (dark).—Dissolve 8¾ oz. parchment shavings in 1½ gal. water, and mix in 8¼ lb. of white lead, and 4½ lb. Paris blue.

Blue (light).—Dissolve parchment shavings as before, and mix in 8¾ lb. of white lead and 2¼ oz. Paris blue.

Green (dark).—Dissolve 13 oz. parchment shavings in 2½ gal. water, and mix in 10 lb. of Schweinfurth green.

Green (pale).—Prepare solution of parchment as in the last, and mix with 8¾ lb. of Schweinfurth green and 1 lb. fine Paris blue.

Orange Yellow.—Dissolve 8¾ oz. parchment shavings in 1½ gal. water, mix with 1½ lb. lemon chrome, 8¾ oz. orange chrome, and 1 lb. white lead.

Red (dark).—Dissolve 8¾ oz. parchment shavings in 1½ gal. water, add 7¾ lb. fine cinnabar and 1 lb. Turkey red.

Red (pale).—To the same quantity of parchment liquor add 8¾ oz. Turkey red.

Violet (light).—To 1½ gal. parchment liquor add 4¼ lb. white lead, 13 oz. light mineral blue, and 8¾ oz. scarlet lake.

Violet (dark).—To 1½ gal. parchment liquor add 3¾ lb. of white lead, 1 lb. pale mineral blue, and 8¾ oz. scarlet lake.

Yellow (pale).—To 1½ gal. parchment liquor add 2 lb. light chrome yellow, and 8¾ oz. white lead.

Stains for Satin Papers.—For each ream of paper of medium weight and size, the following recipes are given:

Blue (azure).—Dissolve 13 oz. parchment shavings in 2½ gal. of water, mix with 3 lb. Bremen blue, 1¾ lb. English mineral blue, and 4½ oz. wax soap.

Blue (light).—Dissolve 8¾ oz. parchment in 1½ gal. of water, mix with 13 oz. light chrome yellow; jewelers' rouge, 6½ oz.; Frankfort black, 2 oz.; powdered chalk, 3 lb.; and wax soap, 3½ oz.

Brown (red).—Dissolve 8¾ oz. parchment add yellow ocher, 1 lb.; light in 1½ gal. water; oz.; white lead, 1 lb.; red chrome yellow, 4½ oz.; 3½ oz. ocher, 1 oz.; wax soap,

Brown (light).—1½ gal. parchment liquor as before, add 13 oz. light chrome yellow, 6½ oz. jewelers' rouge, 2 oz. Frankfort black, 3 lb. powdered chalk, 3½ oz. wax soap.

Gray (light).—1½ gal. parchment liquor, mixed with 4¼ lb. powdered chalk, 8¾ oz. of Frankfort black, 1 oz. Paris blue, 3½ oz. wax soap.

Gray (bluish).—To 1½ gal. parchment liquor add 4¼ lb. powdered chalk, 1 lb. light mineral blue, 4½ oz. English green, 1¾ oz. Frankfort black, and 3½ oz. wax soap.

Green (brownish).—To 1½ gal. parchment liquor add 1 lb. Schweinfurth green, 8¾ oz. mineral green, 4½ oz. each of burnt umber and English pink, 1 lb. whiting, and 3½ oz. wax soap.

Green (light).—To 1½ gal. parchment liquor add 2¾ lb. each of English green and powdered chalk, and 3½ oz. wax soap.

Lemon Color.—To 1½ gal. parchment liquor add 1½ lb. lemon chrome, 1 lb. white lead, and wax soap, 3½ oz.

Orange Yellow.—1½ gal. parchment liquor, 4¼ lb. lemon chrome, 8¾ oz. Turkey red, 1 lb. white lead, 3½ oz. wax soap.

Violet (light).—1½ gal. parchment liquor, mixed with 1½ lb. of light mineral blue, 1½ lb. scarlet lake, 1 lb. white lead, and 3½ oz. wax soap.

White.—To 1½ gal. parchment liquor add 8¾ lb. Kremnitz white, 4½ oz. Bremen blue, 3½ oz. wax soap.

Silver White.—1½ gal. parchment liquor mixed with 8¾ lb. Kremnitz white; 8¾ oz. Frankfort black; 3½ oz. wax soap.

Pale Yellow.—1½ gal. parchment liquor, mixed with 4½ lb. light chrome yellow, 1 lb. powdered chalk, 3½ oz. wax soap.

Glass Paper.—The fragments of broken wine bottles, etc., are carefully washed to remove dirt, the glass is crushed under a revolving stone and sifted into six sizes, as in manufacturing emery. It is sifted through sieves of wire cloth, which are generally cylindrical, like the bolts of flour mills. The cloths have from sixteen to ninety wires to the inch. A surface of thin glue is spread on the paper, and the pulverized glass dusted over it with a sieve.

Graphitized Paper.—To combine graphite with paper and other fibrous materials, Alonzo Hitchcock treats the latter with a bath of sulphuric acid diluted with one half the quantity of water, until the surface is turned to a gelatinous state. One or both surfaces should then be covered with pulverized graphite, and then put in a bath of alkaline liquid to neutralize the acid. Cotton or flax thread, or yarn, may be treated in the same manner. By mixing nitric acid with the sulphuric, raw cotton may be used.

Greasy Paper, to Write on.—To one ox gall add a handful of salt and ¼ pt. vinegar. If the parchment or paper is greasy, add a little of this to the ink.

Hardening Paper.—The French papers speak of a method of rendering paper extremely hard and tenacious by subjecting the pulp to the action of chloride of zinc. After it has been treated with the chloride it is submitted to a strong pressure, thereafter becoming as hard as wood and as tough as leather. The hardness varies according to the strength of the metallic solution. The material thus produced can be easily colored. It may be employed in covering floors with advantage, and may be made to replace leather in the manufacture of coarse shoes, and is a good material for whip handles, the mountings of saws, for buttons, combs, and other articles of various descriptions. An ex-

cellent use of it is in large sheets for roofing. Paper already manufactured acquires the same consistency when plunged, unsized, into a solution of the chloride.

Hydrographic Paper.—A name applied to prepared paper which is written on with water, when the writing appears.—1. Calcined sulphate of iron, 1 part, and 4 parts nutgalls, both finely powdered, are rubbed into the paper with pressure. Writes black with water.

2. Use persulphate of iron and ferrocyanide of potassium in the same way as No. 1.

3. As in the last, using copper sulphate instead of iron sulphate. Writes brown.

4. Wet the paper with a colorless solution of ferrocyanide of potassium, and after drying write on the paper with a solution of persulphate of iron. Writes blue. See also Inks—Sympathetic.

India Paper.—This paper is much used for proofs of etchings. In printing upon India paper no cement is used to attach it to the plate paper, the pressure exerted by the cylinder being sufficient to cause adhesion.

Insulating Paper.—Absorbent tissue paper is rendered insulating by steeping it in melted paraffin, and is used for the dielectric of large telegraph condensers, and Muirhead's artificial cable. An insulating varnish for paper is made by mixing 1 part Canada balsam and 2 parts essence of turpentine. Digest in a bottle with a gentle heat, and filter before cooling.

Iridescent Paper.—Gall nuts (coarsely powdered), 6¾ oz.; sulphate of iron, 4½ oz.; sulphate of indigo, ¾ oz.; gum arabic, 18 grn. Boil these ingredients, strain through a cloth, brush the paper with the liquid, and expose to vapor of ammonia.

Issue Paper.—One part each of elemi, spermaceti, and Venice turpentine; white wax, 2 parts; melt them together by gentle heat, and spread the mixture on paper. Used to keep issues open.

Lithographic Paper.—To prevent ink from adhering to and sinking into lithographic paper, which would render a perfect transfer to the stone impossible, the following plans are used

1. Coat the paper with 3 successive layers of sheep-foot jelly, 1 of cold white starch, and 1 of gamboge. The first coat is applied by a sponge dipped in the hot solution of jelly, thinly but very evenly over the whole surface; the others are applied in succession, each previous one being allowed to dry first. When the paper is dry, it is smoothed by passing through the lithographic press.

2. Cover rather strong unsized paper with a varnish composed of 120 parts starch, 40 of gum arabic, and 20 of alum. Make a moderate paste of the starch by boiling, dissolve the gum and alum separately, and then mix all together. When well mixed, apply hot with a flat smooth brush to the leaves of paper. Dry and smooth by passing under the press.

3. This paper, which is written upon with lithographic ink, may be prepared by either of the following formulæ: Take starch, 6 oz.; gum arabic, 2 oz.; alum, 1 oz. Make a strong solution of each separately in hot water, then mix the whole and strain the liquor through gauze. It must be applied to one side of the paper while still warm by means of a soft brush or sponge. A second or third coating may be given as the preceding one becomes dry. The paper is finally pressed to render it smooth.

4. The paper must first receive 3 coats of thin size, one coat of good white starch, and 1 coat of a weak solution of gamboge in water. The ingredients are to be applied cold with a sponge and each coat allowed to dry before the next is applied.

Litmus Paper, to Prepare.—The preparation of litmus is as follows The ground lichens are first treated with urine containing a little potash, and allowed to ferment for several weeks, whereby they produce a purple red; the colored liquor, treated with quicklime and some more urine, is again set to ferment during two or three weeks; then it is mixed with chalk or gypsum into a paste which is formed into small cubical pieces by being pressed into brass moulds and dried in the shape. Litmus is easy to pulverize, is partially soluble in water and dilute alcohol, leaving a residue consisting of calcium carbonate, silica, gypsum and iron oxide combined with the dye. This residue is not soluble unless by treatment with acids, which would interfere with the action of the litmus. For making litmus paper an infusion of 1 oz. litmus to ½ pt. hot water is recommended by Faraday.

Luminous Paper.—1. Dry thoroughly and mix by grinding, 3 parts gelatine, 3 parts potassium bichromate and 37½ parts calcium sulphide. Stir 1 part of the powder with 1½ parts boiling water to a thickly fluid paint. Apply one or two coats with a brush to the paper or pasteboard to be made luminous.

2. A foreign journal says that a luminous waterproof paper, which may be of use in places not well adapted for the application of the so-called luminous paint, may be made from a mixture of 40 parts pulp, 10 parts phosphorescent powder, 1 part gelatine, 1 part potassium bichromate and 10 parts water.

Manifold Paper.—Saturate fine unglazed paper with the following: Tallow, 2 oz.; graphite in finest powder, ½ oz.; linseed oil, ¼ pt.; lampblack, sufficient quantity to make it of the consistence of cream. Melt and rub together in a mortar.

Paper, to Remove Mildew from. See **Cleansing** (*Mildew*).

Oiled Paper.—1. Brush sheets of paper over with boiled oil in which a little shellac has been carefully dissolved over a slow fire; suspend on a line till dry.

2. The paper is laid on a square board and well covered with a mixture composed as follows: Boiled linseed oil is reboiled with litharge, lead acetate, zinc sulphate and burnt umber, 1 oz. of each per gal. The first sheet is covered on both sides; the second, placed on this, receives one coating and so on; separate and hang up to dry.

Ozone Papers.—Mix boiled starch water with a small quantity of a solution of iodide of potassium, moisten papers with it, dry them and keep ready for use. If there is any ozone or acid vapors in the air, they will set the iodine free, and this will color the starch blue. The way to use this paper is evident.

Packing Paper.—1. Packing paper may be made water tight by dissolving 1·82 lb. of white soap in 1 qt. water, and dissolving in another quart 1·82 oz. (apothecaries' weight) gum arabic and 5·5 oz. glue. The two solutions are mixed and warmed, the paper is soaked in the mixture and passed between rollers or hung up to dry.

2. The paper is treated with boiled linseed oil, the excess of oily particles being removed by benzine; it is then washed in a chlorine bath, and after drying, treated with hydrogen peroxide. If the paper has been made from ropes it is coated with a layer of starch before the treatment of linseed oil and benzine. The final operation is satining, by a passage through smooth rollers.

3. Russian oil cask bottoms are often pasted over on the outside with a kind of paper having a gelatinous looking skin, and which is quite oil tight. Such has been brushed over with a mixture of blood and lime, a preparation much used in Russia and China, and quite oil and water tight.

Papyrine.—Dip white unsized paper for ½ minute in strong sulphuric acid, afterward in water containing a little ammonia. Paper thus treated has, when dry, the toughness and appearance of parchment.

Paraffine Paper.—Dissolve paraffine in ben-

zine, and into the warm solution dip the paper, sheet by sheet; let drip off and dry. On the large scale it may be done by letting paper from a continuous roll pass through such a solution and then between flannel to absorb the surplus. Wax is best dissolved in carbon disulphide, and paper can thus be made ready for use in five minutes. Quite a good plan is to apply the benzine solution of paraffine by means of a sponge.

Parchment Paper.—Strong unsized paper is immersed for a few seconds in oil of vitriol diluted with half its volume of water. It is then washed in pure water or weak ammonia water. The acid solution must not be warmer than the surrounding atmosphere.

Parchment Paper, to Paste.—Moisten the surface of that part of the paper which is to be joined with alcohol or brandy, then apply the glue or paste; gum arabic will not answer. A firm joint may be made by inserting a piece of very thin paper between the surfaces of the parchment paper.

Phenyl Paper.—Used for packing meat and substances liable to decay. Fuse 12½ parts stearic acid at a moderate heat. Mix with 5 parts carbolic acid and 12½ parts paraffine (melted). Stir until the mixture becomes solid. Take the paper and go over quickly with a hot iron, against which is held a piece of the mixture, which will melt and run down on the paper.

Paper Powder.—Sometimes called pollen powder. Boil the paper for a number of hours, strain and reduce to fine powder in a mortar. Sift this powder through a fine sieve. The powder is used to give the bloom to artificial fruit and is also used by taxidermists.

Prepared Paper.—Paper prepared so that a brass pointer leaves a black mark on it. Dissolve ¼ oz. pure sodium sulphide and ½ oz. sodium hyposulphite in 1 qt. rain water; filter the solution, and with it uniformly moisten the surface of the paper; then dry the latter under pressure between clean blotting paper.

Razor Strop Paper.—1. Mix the finest emery and finely powdered glass with paper pulp and make into sheets in the ordinary way. Glue to a strip of wood.

2. Smooth unsized paper is rubbed over after dampening with a mixture of calcined peroxide iron and emery.

3. Paper prepared after the following recipe is said to render the use of the razor strop unnecessary. By merely wiping the razor on the paper to remove the lather after shaving, a keen edge is maintained without further trouble. The razor must be well sharpened at the outset. First, procure oxide of iron (by the addition of carbonate of soda to a solution of persulphate of iron), well wash the precipitate, and finally leave it of the consistence of cream. Spread this over soft paper very thinly with a soft brush. Cut the paper in pieces two inches square, dry, and it is ready for use.

Resin.—1. Spread evenly with black pitch. 2. Beeswax, 2 oz.; tar and resin, each, 6 oz.; melt and spread evenly on paper.

Removal of Paper.—The only way in which the paper can be removed is by covering it with a damp cloth until it is sufficiently moist, when it can be easily taken off.

Safety Paper.—Protective for checks. Print with a fugitive writing ink, which will be easily destroyed.

Non-erasible Paper.—1. Paper may be prepared for bank checks and other documents so that any writing in ink once made thereon cannot be altered without leaving plainly visible marks, by passing the sheets through a solution composed of 0·015 grn. gallic acid to 1 gill distilled water.

2. A simple way of preparing paper for bank checks, bills, etc., so that no writing can be erased without leaving plainly visible marks, is to pass the sheets through a solution of gallic acid. One milligram (0·01543 of a grn.) is dissolved in as much pure distilled water as will fill an ordinary soup plate to a moderate depth.

Paper, Sensitized. See **Photography.**

Paper for Wrapping Up Silver.—Six parts of caustic soda dissolved in water until the hydrometer shows 20° B. To this solution are added four parts of oxide of zinc, and boiled until dissolved. Sufficient water must next be added to reduce the solution to 10° B. Next dip paper or calico into this solution and dry. This wrapping will very effectually preserve silver articles from being blackened by sulphureted hydrogen, which, as is well known, is contained in the atmosphere of all large cities.

Size, for Paper.—Glue and alum water is about as satisfactory a size as can be used. Besides isinglass, mentioned above, a mixture of starch or dextrine and alum can be used. The cheaper sizes are made by heating clippings of hides, horns, bones, etc. The process is as follows: The articles, generally the first mentioned, are softened by soaking in cold water for a day or two; after that they are well cleaned by washing in running water. The next operation is to boil, or rather heat them with water. The temperature should never be allowed to rise much above 85° C. (185° F.), as gelatine strongly heated for any length of time loses its power of gelatinizing. The operation should be conducted in an iron or copper vessel, provided with a false bottom or a casing outside, where steam may be introduced, and it should extend over about fifteen hours. The solution should then be drawn off and filtered into some convenient receptacle. The residue can again be heated with water, and a fresh quantity obtained, which may be added to the bulk. A quantity of alum (about 20% of the clippings) dissolved in water is added. The size should be well filtered through woolen felt, after which it requires no further treatment.

Split Paper.—1. Get a piece of plate glass and place it on a sheet of paper; then let the latter be thoroughly soaked. With care and a little dexterity the sheet can be split by the top surface being removed. But the best plan is to paste a piece of cloth or strong paper to each side of the sheet to be split. When dry, violently and without hesitation, pull the two pieces asunder, when part of the sheet will be found to have adhered to one and part to the other. Soften the paste in water, and the pieces can be easily removed from the cloth.

The process is generally demonstrated as a matter of curiosity, yet it can be utilized in various ways. If we want to paste in a scrapbook a newspaper article printed on both sides of the paper, and possess only one copy, it is very convenient to know how to detach the one side from the other. The paper, when split, as may be imagined, is more transparent than it was before being subjected to the operation, and the printing ink is somewhat duller; otherwise the two pieces present the appearance of the original if again brought together.

2. The paper to be split is pasted between two sheets of compact strong paper. The best flour paste should be used. Mucilage is unreliable. When nearly dry, if the two outer pieces of paper are pulled apart, the central one will split, and one-half of the central piece will adhere to each. By soaking in water they can be removed. Some kinds of paper work better than others. If the outer paper is of a loose texture, it may split instead of the desired one.

Paper, Removal of Stains from. See also **Cleansing.**—Oil stains may be removed from paper by applying pipe clay powdered and mixed with water to the thickness of cream; leave on for four hours.

Sticking Paper.—Brush over your sheets a solution of dextrin, with sugar mixed.

Test Papers.—Use good unsized paper, wet uniformly with the substance. In preparing

decoctions, making solutions, etc., where water is used, only distilled water must be used.

1. Brazil Wood.—Make from the decoction; alkalies turn it to a purple; acids, if strong, to a red.

2. Buckthorn.—Reddened by acids.

3. Cherry Juice.—Same as buckthorn.

4. Dahlia.—This very delicate test is turned green by alkalies, red by acids; caustic alkalies yellow.

5. Elderberry.—Same as last.

6. Same as last.

7. Iodide of Potassium.—Make the solution in distilled water. Used in a number of ways as a test.

8. Lead Acetate.—Make from a solution of the salt in water. Used to detect hydrogen sulphide.

9. Litmus. See *Litmus Paper*.

10. Mallow.—Prepare an infusion of the purple flowers of the mallow. Affected the same as the dahlia paper.

11. Manganese.—From solution of manganese sulphate; blackened by ozone.

12. Rhubarb.—Make a strong infusion of the powdered root. Alkalies turn it brown; boracic acid has no effect upon it.

13. Rose.—Made from a strong infusion of the leaves of the red rose. Alkalies turn it green.

14. Starch.—From a cold decoction of starch. Free iodine turns it blue.

15. Sulphate of Iron.—From a solution of ferrous sulphate. Used as a test for hydrocyanic acid.

16. Turmeric.—This is made by preparing an alcoholic tincture of turmeric root. Unsized paper may be stained with it; used in testing for alkalies.

Tracing Paper.—The following receipts are from the Mechanics' Own Book:

1. A German invention has for its object the rendering more or less transparent of paper used for writing or drawing, either with ink, pencil or crayon, and also to give the paper such a surface that such writing or drawing may be completely removed by washing, without in any way injuring the paper. The object of making the paper translucent is that when used in schools the scholars can trace the copy, and thus become proficient in the formation of letters without the explanations usually necessary; and it may also be used in any place where tracings may be required, as by laying the paper over the object to be copied it can be plainly seen. Writing paper is used by preference, its preparation consisting in first saturating it with benzine, and then immediately coating the paper with a suitable rapidly drying varnish before the benzine can evaporate. The application of varnish is by preference made by plunging the paper into a bath of it, but it may be applied with a brush or sponge. The varnish is prepared of the following ingredients: Boiled bleached linseed oil, 20 lb.; lead shavings, 1 lb.; zinc oxide, 5 lb.; Venetian turpentine, ½ lb. Mix, and boil eight hours. After cooling, strain, and add 5 lb. white copal and ½ lb. sandarac.

2. The following is a capital method of preparing tracing paper for architectural or engineering tracings: Take common tissue or cap paper, any size of sheet; lay each sheet on a flat surface, and sponge over (one side) with the following, taking care not to miss any part of the surface: Canada balsam, 2 pt.; spirits of turpentine, 3 pt.; to which add a few drops of old nut oil; a sponge is the best instrument for applying the mixture, which should be used warm. As each sheet is prepared, it should be hung up to dry over two cords stretched tightly and parallel, about 8 in. apart, to prevent the lower edges of the paper from coming in contact. As soon as dry, the sheets should be carefully rolled on straight and smooth wooden rollers about 2 in. in diameter, covered with paper. The sheets will be dry when no stickiness can be felt. A little practice will enable any one to make good tracing paper in this way at a moderate rate. The composition gives substance to the tissue paper.

3. You may make paper sufficiently transparent for tracing by saturating it with spirits of turpentine or benzoline. As long as the paper continues to be moistened with either of these, you can carry on your tracing; when the spirit has evaporated, the paper will be opaque. Ink or water colors may be used on the surface without running.

4. A convenient method for rendering ordinary drawing paper transparent for the purpose of making tracings, and of removing its transparency, so as to restore its former appearance when the drawing is completed, has been invented by Puscher. It consists in dissolving a given quantity of castor oil in 1, 2, or 3 volumes of absolute alcohol, according to the thickness of the paper, and applying it by means of sponge. The alcohol evaporates in a few minutes and the tracing paper is dry and ready for immediate use. The drawing or tracing can be made either with lead pencil or Indian ink, and the oil removed from the paper by immersing it in absolute alcohol, thus restoring its original opacity. The alcohol employed in removing the oil is, of course, preserved for diluting the oil used in preparing the next sheet.

5. Put ¼ oz. gum mastic into a bottle holding 6 oz. best spirits of turpentine, shaking it up day by day; when thoroughly dissolved, it is ready for use. It can be made thinner at any time by adding more turps. Then take some sheets of the best quality tissue paper, open them, and apply the mixture with a small brush. Hang up to dry.

6. Saturate ordinary writing paper with petroleum, and wipe the surface dry.

7. Lay a sheet of fine white wove tissue paper on a clean board, brush it softly on both sides with a solution of beeswax in spirits of turpentine (say about ½ oz. in ½ pint), and hang to dry for a few days out of the dust.—*Mechanics' Own Book.*

8. Tracing Paper that may be Washed.—Use writing paper, saturate it with benzine, and then immediately coat the paper with a suitable, rapidly drying varnish before the benzine can evaporate. The varnish is prepared as follows: Boiled bleached linseed oil, 20 lb.; lead shavings, 1 lb.; zinc oxide, 5 lb.; Venice turpentine, ½ lb.; mix and boil for 8 hours. After cooling, strain, and add white gum copal, 5 lb., and gum sandarac, ½ lb. Thus prepared the paper will be found to possess all the requisites for use as stated above.—*Science Record*, *1874*.

9. Steep sheets of suitable paper in a strong solution of gum arabic, and afterward take off the superfluity of the liquid by pressing each sheet between two others of similar paper, but dry. It will be found that the three sheets are converted into a first-rate tracing paper. It is indispensable that the solution be strong, about the consistency of boiled oil. Paper prepared as above directed possesses every requisite that can be wished for.

Transfer Paper.—1. Rub the surface of thin post or tissue paper with graphite, black lead, vermilion, red chalk, or other pigment and carefully remove the excess of coloring matter by rubbing with a clean rag.

2. Rub into thin white paper a mixture of 6 parts lard and 1 part beeswax, with sufficient fine lampblack to give it a good color; apply the mixture warm, and not in excess.

3. Under exactly the same conditions use a compound consisting of 2 oz. tallow, ½ oz. powdered blacklead, graphite, ¼ pt. linseed oil, and enough lampblack to produce a creamy consistence.—*Mechanics' Own Book.*

4. Black Transfer Paper.—Get some unglazed paper and rub it well with a paste made of gas black or black from a paraffine lamp and olive oil, with a piece of sponge.

5. Writing and Drawing on Transfer Paper.—To dissolve solid lithograph ink, warm the pot at the fire or gas, using rain or distilled water to rub it down with, as it is softer than other water. The pen will be found to work better at first if it is dipped in oil, and then wiped previous to writing.

6. Brackelsberg's multiplying paper consists of sheets of paper, each one supplied with a coloring layer whose principal element is a violet aniline methyl. An oiled leaf serves as a hard, smooth under layer. Place a sheet of the copy paper on this, then a sheet of writing paper and write with a hard lead pencil. The back of the writing paper will give a negative of the writing in high color. Wet the copy sheet thoroughly, and from it twenty or more copies can be made, which will not roll nor show a gelatinous coating. Embroidery and compass sawing patterns are finely rendered in this way.

Transfer Paper for Warm Stones. — Make a size by boiling parchment cuttings. Let it be so strong that when cold it will be firm jelly. Grind dry flake white with water, add it to the size after warming it, mix well and rub through a sieve. The proportion of flake white may vary with circumstances. If too much be used pens will not work upon it properly, and probably the finest lines will fail in transferring. Coat the paper with the composition with a full brush, or use a sponge and give two coats, the second when the first is dry. If for writing, the paper may be thin, if for drawing it should be thicker, using drawing paper for very large subjects. The stone for this paper should be quite warm. Similar paper is made from gelatine or from the better sorts of glue, instead of parchment cuttings. Other substances are also used instead of flake white, such as chalk and old plaster of Paris. Flake white is best because it grinds up so finely.

Paper for Cold Stones.—Take 4 oz. of starch and 1 oz. best pale colored glue. Break the glue and put it in cold water overnight to soak. Mix the starch with a little cold water and then pour boiling water upon it till it thickens, stirring it all the time. Now put in the glue and boil over a slow fire or gas jet, brush over the paper while warm. This may be used on tracing paper, printing paper or writing paper. For ordinary use printing paper is preferable, because the water penetrates more quickly through the back of it in transferring. Some persons add a little flake white. If a more adhesive paper is required, a common kind of glue may be used and its proportion increased or gum arabic, or even dextrine, may be added.

Lithographic Transfer Paper. — Dissolve in water ½ oz. gum tragacanth. Strain and add 1 oz. of glue and 1 oz. of gamboge. Then take 4 oz. French chalk, ½ oz. old plaster of Paris, 1 oz. starch; powder, and sift through a fine sieve; grind up, with the gum, glue, and gamboge; then add sufficient water to give it the consistence of oil, and apply with a brush to thin sized paper.

Coloring Transfer Paper.—The addition of coloring matter to transfer paper is for the more ready determination of the coated side. Gamboge is generally used, but any kind of coloring matter will answer the purpose. A light pink tint is distinguishable by artificial light, while a yellow is scarcely visible. Rose pink or a solution of cochineal in ammonia answers this purpose.

To Toughen Paper.—A plan for rendering paper as tough as wood or leather consists in mixing chloride of zinc with the pulp in the course of manufacture. It has been found that the greater the degree of concentration of the zinc solution, the greater will be the toughness of the paper. It can be used for making boxes, combs, for roofing, and even for making boots.

Transparent Paper.—There are several methods of rendering paper transparent, among which the following have been recommended: Boiled and bleached linseed oil, 120 parts; lead turnings, 6 parts; oxide of zinc, 30 parts; Venice turpentine, 3 parts. The above ingredients are placed in an iron or other suitable vessel, in which they are thoroughly mixed and the whole then boiled for about eight hours. The mixture is then allowed to cool, when it is again well stirred and the following substances added: White copal, 30 parts; gum sandarac, 2 parts; these ingredients being well incorporated by stirring.

Drawing Paper, to Render Transparent.—Dissolve a given quantity of castor oil in 1, 2 or 3 volumes of absolute alcohol, according to the thickness of the paper, and apply with a sponge. The alcohol evaporates in a few minutes and the tracing paper is ready for immediate use. The drawing or tracing can be made either with lead pencil or India ink, and the oil removed from the paper by immersing it in absolute alcohol, thus restoring its original opacity. The ink used must be of the water-proof variety.

Paper, Varnish for. See **Varnishes.**

Paper, to Waterproof. See **Waterproofing.**

Waxed Paper. — Place cartridge or other paper on a hot iron and rub it with beeswax, or brush on a solution of wax in turpentine. On a large scale, it is prepared by opening a quire of paper flat upon a table, and rapidly ironing it with a heavy hot iron, against which is held a piece of wax, which, melting, runs down upon the paper and is absorbed by it. Any excess on the topmost layer readily penetrates to the lower ones. Such paper is useful for making waterproof and airproof tubes, and for general wrapping purposes.

Paper Hanging.—The art of putting on or hanging paper, is very simple, and is easily learned; but to make a tasteful choice of paper for various situations is not so easy. Hence the following remarks, which may be of service to the workman or others on whom the selection of paper may devolve.

Walls to a room should be regarded only in the light of a framework to what the room contains, and should be decorated so as to bring into prominence and not eclipse the other parts of the chamber. Nothing destroys the effect of a room so much as a handsome but staring wall paper, or a wall so profusely ornamented as to strike upon the eye to the exclusion of the rest of the decorations. Thus bringing forward what should be the background into the most conspicuous place. A modern drawing room is always difficult to decorate artistically, because of the taste of its builders for heavy cornices, prominent mantelpieces and rooms too lofty for their size; and as all these misnamed embellishments are too costly to remove by tenants, the only plan to pursue is to destroy their effect by exercising both taste and ingenuity. First, with regard to the ceiling, the ornamental plaster boss in its center should be removed and the ceiling tinted a color that harmonizes with the wall paper, as no harmonies can be hoped for when what produces them is surmounted with the glaring white of an ordinary ceiling. The tint used must be one that softens into the wall paper, not one that contrasts; thus, if the tone of the room is that of a soft gray blue, the ceiling should be a clear flesh pink; or should a gray green picked out with black be the chosen color, then it should be colored a subdued lemon.

Some people cover their ceilings with a whole colored paper, and border it with a stenciled pattern representing the thin garlands

so familiar upon Queen Anne decorations, but this is a more troublesome plan than the simple coloring, which answers all the purposes. The walls, if they are lofty, require a high dado. These high dados give a look of comfort and home that is absent from the modern high pitched room papered with one uniform pattern. The dado is divided 3 ft. to 4 ft. from the ceiling, and the coloring of the lower portion must always be heavier than that used on the upper, or a top-heavy look will be given to the room. When many pictures are to be hung up, the lower part of the dado should be of a whole color, either a whole colored paper or a painted wall, as pictures are only shown off upon such a background. When a whole tint is used for the lower part of the dado, the upper portion should be decorated with a frieze paper of a good bold pattern, but of subdued coloring, and of tint that harmonizes with the lower. Thus, the color used about the frieze should be the same as that on the lower part, but of a lighter shade, intermixed with some other colors that form a harmonious link between the two shades. Contrasts must be carefully avoided, but pale pinks, blue and ambers can be blended together above a subdued gray blue ground. The two portions of the dado should be joined together with a light wooden (black or brown) railing, or with a line of paint.

The dado decoration can be altered by placing the pattern paper upon the lower part and leaving the upper plain colored, with or without a stenciled pattern upon it. This will suit a room where not many pictures are required, or that is already rather dark. Some part of the wall should always be in plain color, as the eye requires rest; and no pattern, however subdued in hue, can give the relief to the mind that a bit of plain coloring affords, and this scarcity of ornament in one part of a room is amply repaid by the effect it gives to such parts as are bright and should be bright. The true theory of effect is to use but one or two bright colors in a room, and to surround them by soft and subdued tints that throw up and do not destroy their brilliancy; a number of bright colors placed together destroy each other and leave no impression upon the mind but glare and vulgarity. Having settled upon your paper and ceiling, have the woodwork and cornice of the room painted either a shade lighter or darker than the walls, and shroud up the mantelpiece with curtains, etc., of satin sheeting embroidered with crewels, and instead of the usual looking glass over the fireplace, have a mirror surrounded with brackets holding china; or have a black wooden mantelpiece made with squares of looking glass set in. The background of your room being thus completed in a manner really to be a background, your furniture will look twice as well as if it were stared out of countenance by the walls, and one need hardly add that all your friends will delight in a room that throws up and brings out their dresses and faces, instead of killing them by its glaring tints.

To prepare the walls, make a size of glue and water, then give the walls a coat of a very weak solution of the same. To make a paste, take 2 lb. of fine flour, put in a pail, add cold water and stir it up together in a thick paste. Take a piece of alum about the size of a small chestnut, pound it fine and throw it into the paste; mix well. Then provide about 6 qt. of boiling water and mix while hot with the paste until the whole is brought to a proper consistency. This makes an excellent paste, and fit for use when cold.

Paper, Wall.—The following table from the *New York Newsdealer* shows how many rolls of wall paper are required to cover a room of the dimensions indicated by the figures in the left hand column, also the number of yards of border necessary:

Size of Room.	Height of Ceiling.	Number of Doors.	Number of Windows.	Rolls of Paper.	Yards of Border.
7×9	8	1	1	6	11
7×9	9	1	1	7	11
7×9	10	1	1	8	11
7×9	12	1	1	10	11
8×10	8	1	1	7	12
8×10	9	1	1	8	12
8×10	10	1	1	9	12
8×10	12	1	1	11	12
9×11	8	1	1	8	14
9×11	9	1	1	10	14
9×11	10	1	1	11	14
9×11	12	1	1	13	14
10×12	8	1	1	9	15
10×12	9	1	1	10	15
10×12	10	1	1	11	15
10×12	12	1	1	13	15
11×12	8	2	2	8	16
11×12	9	2	2	9	16
11×12	10	2	2	10	16
11×12	12	2	2	13	16
12×13	8	2	2	8	17
12×13	9	2	2	10	17
12×13	10	2	2	11	17
12×13	12	2	2	14	17
12×15 or 13×14	8	2	2	10	18
12×15 or 13×14	9	2	2	11	18
12×15 or 13×14	10	2	2	12	18
12×15 or 13×14	12	2	2	15	18
13×15	8	2	2	10	19
13×15	9	2	2	11	19
13×15	10	2	2	13	19
13×15	12	2	2	16	19
14×16	9	2	2	12	20
14×16	10	2	2	14	20
14×16	12	2	2	17	20
14×18	9	2	2	13	22
14×18	10	2	2	15	22
14×18	12	2	2	19	22
15×16	10	2	2	15	21
15×17	12	2	2	19	22

Deduct one-half roll of paper for each ordinary door or window extra—size 4x7 feet.

Papier Maché, *to Clean.* See **Cleansing.**

Papier Maché.—Paper *maché* is obtained from old paper and the like made into a pulp by grinding with milk of lime or lime water, and a little gum dextrin or starch. This pulp is then pressed into form, coated with linseed oil, baked at a high temperature, and finally varnished. The pulp is sometimes mixed with clay (kaolin), chalk, etc.; and other kinds are made of a paste of pulp and recently slaked lime. This is used for ornamenting wood, etc.

2. Pulped Paper Moulded into Forms.—It possesses great strength and lightness. It may be rendered partially water proof by the addition of sulphate of iron, quicklime and glue, or white of egg, to the pulp; and incombustible by the addition of borax and phosphate of soda. The papier maché tea trays, waiters, snuff boxes, etc., are prepared by pasting or gluing sheets of paper together, and submitting them to powerful pressure, by which the composition acquires the hardness of board when dry. Such articles are afterward japanned, and are then perfectly water proof.

3. A durable and inexpensive method of employing papier maché as a substitute for mattings, carpets, etc., is as follows: After the floor has been thoroughly cleaned, the holes and cracks are then filled with paper putty, made by soaking newspaper in a paste made of wheat flour, water, and ground alum, that is, to 1 lb. of such flour are added 3 qt. of water and a tablespoonful of ground alum, these being thoroughly mixed. With this paste the floor

is uniformly coated, and upon this a thickness of manila or hardware paper is placed, or if two layers are desired, a second covering of paste is spread on the first layer of manila paper, and then the second thickness of paper is put on, and the whole allowed to become perfectly dry; on this being accomplished another surface of paste is added, succeeded by a layer of wall paper of any style or pattern desired. On the work becoming entirely dry, it is covered with two or more coats of sizing, made by dissolving ½ lb. of white glue in 2 qt. of hot water, and when this has dried, a coat of hard oil finish varnish.

4. Paper is pulped in a mortar (or pulping engine) and mixed with ordinary glue size thinned somewhat with hot water. Remove the pulp and let it partially drain upon a linen covered frame. Put a quantity of this into the mould under strong pressure, and let it remain until it becomes hard enough to handle. A counter mould is used in casting such thin sheets. Plaster moulds are too fragile. Casts in type metal or fusible metal are much better.

Paradise Water. See **Waters.**

Paraffine Paper. See **Paper.**

Parchment, to Clean. See **Cleansing.**

Parchment Glue. See **Glues.**

Parchment, Liquid.—According to Dr. Hofmann, a fluid by this name, consisting of gutta percha softened and soaked in ether, is especially adapted for forming a coating for pictures and cards, it permitting the removal of dirt with a moist rag. Pencil and crayon drawings may be rendered ineffaceable by sprinkling with this liquid by means of an atomizer, an exceedingly delicate film remaining on the evaporation of the ether.

Parchment, to Prevent the Scaling of White Pigment on.—Reduce to powder and dissolve quickly in cold water a quantity of gum tragacanth. There must be sufficient water to give to the diluted gum the consistence of a jelly. Mix with this your pigments (sulphate of baryta), and, after finishing the work, spray with a little naphtha in which has been digested for some time a quantity of caoutchouc. The naphtha will soon evaporate, leaving behind the caoutchouc as an extremely thin and adhesive, but perfectly transparent, film.

Parchment, to Color.—1. Prepare the parchment with pounce as for writing. Use ordinary water colors mixed with alum water. The alum makes the parchment take the paints readily. Go over the part to be painted quickly with the color. It is best to have the parchment on a slanting surface, as then the water does not soak in so much. Parchment does not cockle unless wet through.

2. Green.—Boil 8 parts cream of tartar and 30 parts of crystallized verdigris in 500 parts water; when this solution is cold, pour into it 4 parts nitric acid. Moisten the parchment with a brush, and then apply the above liquid evenly over its surface. The necessary surface finish is given with white of eggs, or mucilage of gum arabic.

Parchment, to Smooth.—To smooth parchment which has become wrinkled, place the parchment face down upon clean blotting paper. Beat up to a clear froth, with a few drops of clove oil, the whites of several fresh eggs, and with the fingers spread this over the back of the sheet and rub it in until the parchment becomes smooth and yielding. Then spread it out as smooth as possible, cover with oil silk and press for a day. Then remove the silk and cover with a linen cloth and press with a warm iron.

Parchment, to Make Transparent.—Soak a thin skin of parchment in a strong lye of wood ashes, often wringing it out until you find it becomes transparent; then strain it on a frame and let dry.

This will be much improved if, after it is dry you give it a coat, on both sides, of clear mastic varnish, diluted with spirits of turpentine.

Parchment, Vegetable.—Is made by dipping ordinary paper, for a few seconds, into a solution containing one part water to six parts sulphuric acid; then washing it carefully, to remove every trace of acid.

Parfait Amour. See **Liquors.**

Paris, Plaster of. See **Plaster of Paris.**

Parkesine.—Name given to a preparation made by incorporating castor oil, collodion and wood spirit. The mixture gradually solidifies and finally becomes a hard mass. It is used for ornamenting combs, knife handles and buttons.

Parlor Matches. See **Matches.**

Paste.—(Ceramics.) Term applied to clay either by itself or mixed with other materials.

Pasteboard, Enamel for. See **Enameling.**

Paste, German.—Pea meal, 2 lb.; sweet almonds (blanched), 1 lb.; fresh butter or lard, ¼ lb.; moist sugar, 5 oz.; hay saffron, ½ drm.; beat to a smooth paste, adding cold water, q. s.; granulate the mass by passing it through a colander, and expose the product to the air in a warm place until quite hard and dry. The addition of two or three eggs improves it. Used to feed larks, nightingales and other insectivorous birds. It will keep good for twelve months in a dry place.

Paste, Shaving. See **Creams.**

Pastes. See also **Cements Glues, and Mucilages.**—1. Take a quart of water and dissolve in it a teaspoonful of pure powdered alum. Stir into this enough of flour to make a thick cream. Break up every little lump of flour until the mixture is smooth. Stir in next a teaspoonful of powdered resin. Now pour in a cupful of boiling water. Stir it all well. When the mixture has thickened from cooking by the boiling water, pour into an earthen vessel. Cover it up and keep it in a cool place. Add a few drops oil of cloves. Whenever you want to use any portion of it, take what you need and soften it with a little warm water.

This will give you a perfect paste, clean, wholesome, and lasting. You will be surprised how little waste you will have. Should you need larger quantities, increase the proportions in proper ratio, doubling or trebling each ingredient, according to the magnitude of the business requiring it.—*American Art Printer.*

2. A solution of 2½ oz. gum arabic in 2 qt. warm water is thickened to a paste with wheat flour; to this is added a solution of alum and sugar of lead, 1½ oz. each in water; the mixture is heated and stirred about to boil and is then cooled. It may be thinned, if necessary, with a gum solution.

Adhesive Paste.—1. Take 4 oz. common gelatine in small pieces and steep it in 16 oz. water until it becomes soft; then by the aid of the heat of a water bath dissolve it, and while still hot pour into a mixture of 2 lb. good flour paste and 1 pt. water. Heat the whole to boiling, and when thickened remove from the fire; while cooling add 6 drm. silicate of soda and stir into the mixture with a wooden spatula. This preparation will keep good for an indefinite period, and is very adhesive. The addition of 2 drm. oil of cloves is an improvement.

2. The following from *Dingler's Journal* is highly recommended. Let 4 parts by weight of glue soften in 15 parts cold water for fifteen hours, after which the mixture is heated until clear. Add 65 parts boiling water. In another vessel stir 30 parts starch paste in 20 parts water. Into this the glue solution is poured. Stir well, and on cooling add 10 drops carbolic acid.

Artists and Architects, Paste for.—Boil white paper in water for five hours, then pour off the

water and pound the pulp in a mortar; pass it through a sieve and mix with some gum water or isinglass glue. It is used in modeling by artists and architects.

Bags, Paste for Manufacture of.—Add to 3 parts wheat starch 24 to 30 parts of cold water, stir together to a homogeneous mass of about the thickness of sirup. Pour over this, with constant stirring, boiling water until the paste is of the required consistency. Stir until partly cold. Take a portion of the paste and add to it 6% to 15% liquefied Venice turpentine, rub together until a kind of emulsion is formed. Then mix the whole together and work thoroughly.

Bill Sticking Paste.—Take flour, 25 lb.; alum in powder, ½ lb.; boiling water sufficient quantity. Paste will not very long resist the action of wet weather; but may be made to do so by giving the bill, after sticking it, a wash of soap water, sugar of lead solution, or a solution of crude lac in naphtha.

Chinese Paste. — Bullock's blood, 9 parts; quicklime, 1 part. Beat to a paste. For use, beat it to a proper consistence with water.

Cloth, Paste for.—Use rye flour paste, adding to it about ¼ the weight of the flour of good glue. As the paste is for immediate use there is no need of adding alum, gum dextrine, or any preservative.

Dextrine Paste.—In hot water dissolve a sufficient quantity of dextrine to bring it to the consistency of honey. This forms a strong adhesive paste that will keep a long time unchanged, if the water is not allowed to evaporate. Sheets of paper may be prepared for extempore labels by coating one side with the paste and allowing it to dry; when to be used, by slightly wetting the gummed side, it will adhere to glass. This paste is very useful in the office or laboratory.

Durable Paste.—Four parts by weight of glue are allowed to soften in 15 parts cold water for some hours, and then moderately heated till the solution becomes quite clear. Sixty-five parts boiling water are now added with stirring. In another vessel 30 parts starch paste are stirred up with 20 parts, so that a thin milky fluid is obtained without lumps. Into this the boiling glue solution is poured, with constant stirring and the whole is kept at the boiling temperature. After cooling, 10 drops carbolic acid are added. Preserve in tight bottles.

Engravings, Paste for.—For this purpose we would recommend the use of a thin paste. A mixture of gum tragacanth and gum arabic, forms with water a thinner mucilage than either of these two gums alone. Rice flour is said to make an excellent paste for fine paper work.

Flour Paste.—1. Water, 1 qt.; alum, ¾ oz. Dissolve, and when cold, add flour to make it of the consistence of cream, then bring it to a boil, stirring it all the while.

2. (Hard).—To the above add a little powdered resin and a clove or two before boiling. This will keep for twelve months. When dry it may be softened with water.

3. Paste for Paper Hanging.—Take ½ quartern of flour (best biscuit) and put it into a pail, with a small portion of alum, broken up small; mix it up into a stiff batter with warm water; have ready a large saucepan of boiling water, and pour it over the paste, stirring well all the time, or it will be lumpy. If properly done, it will thicken as the boiling water is poured over it; if it does not thicken, set it over the fire a few minutes, but be sure you stir it, or it will burn. When well thickened, throw a dash of cold water over it, as it prevents it skinning while cooling. Use rather thin. You can thin it with cold water.

4. Mix 1 lb. rye flour in lukewarm water, to which has been added 1 teaspoonful of pulverized alum; stir until free of lumps. Boil in the regular way or slowly pour on boiling water, stirring all the time, until the paste becomes stiff. When cold add a full ¼ lb. of common strained honey, mix well (regular bee honey, no patent mixture). In labeling always paste the tin (or other work) and apply the label.

Gelatine Paste.—A good paste for mounting photographs, etc., can be made of the following ingredients: Cooking gelatine, 1 oz.; alcohol, 95%, 10 oz.; glycerine, ½ to 1 oz. Soak glycerine in cold water for an hour or more; take out and drain off all the water which will go; add to alcohol in wide mouthed bottle. Add ½ to 1 oz. of glycerine according as gelatine is of a hard or soft kind. Put bottle in hot water, with occasional shaking, until gelatine is quite dissolved. Will keep indefinitely, and has only to be heated up when wanted for use. This paste is applied rapidly and as thinly as possible with a broad bristle (varnish) brush. It is very highly recommended for photographers' use.

Glycerine Paste for Office Use.—Dissolve in 6 oz. boiling water 2 oz. gum arabic and 4 drm. of glycerine.

Paste, Gum Arabic.—Gum arabic (picked), 1 lb.; water, 1 pt., 4 oz.; dissolve; add 1 lb. white sugar; evaporate by a gentle heat to a very thick sirup, then add the whites of 3 eggs, previously beaten up with orange flower water, 1 fl. oz., and strained through muslin, and continue the heat with constant stirring, until of a proper consistence on being cooled. Used as a substitute for marshmallow paste.

Gum Paste.—Ordinary gum paste is made of picked gum arabic and white sugar, equal parts, and to each pound of gum 1 pt. of water. Dissolve the gum, add the sugar, and evaporate until it is thick sirup. Then add the whites of eggs (about 3 to each pound of gum), previously beaten up with orange flower water or other flavoring; strain through muslin, and continue the evaporation until it will set readily when cooled.

Labeling, Paste for.—1. Tragacanth, 1 oz.; gum arabic, 4 oz.; water, 1 pt. Dissolve, strain, and add thymol, 14 grn.; glycerine, 4 oz.; and water to make 2 pt. Shake or stir before using it.

2. Rye flour, 4 oz.; alum, ½ oz.; water, 8 oz. Rub to a smooth paste, pour into a pint of boiling water, heat until thick, and finally add glycerine, 1 oz.; and oil of cloves, 30 drops.

3. Rye flour, 4 oz.; water, 1 pt. Mix, strain, add nitric acid, 1 drm., heat until thickened, and finally add carbolic acid, 10 minims; oil of cloves, 10 minims; and glycerine, 1 oz.

4. Dextrin, 8 parts; water, 10 parts; acetic acid, 2 parts. Mix to a smooth paste, and add alcohol, 2 parts. This is suitable for bottles of wood, but not for tin, for which the first three are likewise adapted.

5. A paste very similar to 3, but omitting nitric acid and glycerine, is also recommended by Dr. H. T. Cummings.—*Am. Journ. Pharmacy.*

6. A good paste for labels for specimens: Starch, 2 dr.; white sugar, 1 oz.; gum arabic, 2 drm.; water, q. s. Dissolve the gum, add the sugar, and boil until the starch is cooked.

7. A good paste is made by soaking flake tragacanth in sufficient cold water that the brush will not sink into the paste when finished. To prevent souring, add to the water 2 grn. hydronaphthol (dissolved in a little alcohol) for each pint, and a few drops clove oil for scent. To keep away the flies add some oil of pennyroyal. Avoid, in making pastes, oil of wintergreen and carbolic acid, for these produce a purplish discoloration by contact with the tinned iron of the brush.

7. Starch paste with which a little Venice turpentine has been incorporated while it is warm.

Sticking Labels to Tinned Plate.—1. Dissolve some isinglass in acetic acid, and brush the labels over with it. There will be no cause to complain of their coming off, nor yet of striking through the paper. Take a wide-mouthed

bottle, fill about two-thirds with commercial acetic acid, and put in as much isinglass as the liquid will hold, and set aside in a warm place until completely dissolved. When cold it should form a jelly. To use it, place the bottle in hot water. The cork should be a well fitting, sound one, and smeared with vaseline or melted paraffine.

See also **Mucilages** for *Tin Plate.*

2. Soften good glue in water; then boil it with strong vinegar, and thicken the liquid, during boiling, with fine wheat flour, so that a paste results.

3. Starch paste, with which a little Venice turpentine has been incorporated while it was warm.

4. T. A. Richardson, the architect, recommends to every 2 tablespoonfuls of the best wheat flour to add a teaspoonful of common moist or brown sugar, and a few drops corrosive sublimate; the whole to be boiled, and continually stirred to prevent getting lumpy, till of the right thickness. To prevent mouldiness, a few drops of some essential oil, as lavender or peppermint. This paste is used to make different thicknesses of cardboard. In putting or jointing together, he recommends 6 oz. gum arabic (best), 1 oz. or less of moist or lump sugar, 1 teaspoonful of lavender or other essential oil, and a tablespoonful of gin; the whole to be mixed in cold water to the consistency of a thick sirup, no heat being in any way applied.

5. Dissolve 180 grn. of best French glue in 180 grn. of water by soaking and heating. Then add a solution of 1 grn. of shellac in 6 grn. of alcohol, and stir well as long as the solution is warm. Mix also 35 grn. of dextrine in 50 grn. of alcohol and 25 grn. of water; stir it well in a beaker and place it into warm water until the solution is completed and has acquired a clear brown color. Mix this solution with that of the glue, and pour the whole into a suitable form in which it may solidify. When wanted for use, cut off a small piece and liquefy it by warming.

6. Soften glue in cold water, and dissolve it in strong vinegar. Mix with it a quantity of dry starch about equal to the glue taken, first having boiled it with water sufficient to form a paste.

7. Labels on Machines, Paste for.—A paste or mucilage to resist damp may be made as follows: Prepare a paste of good rye flour and glue, to which linseed oil varnish and turpentine have been added in the proportion of ½ oz. each to the lb.

8. Paste to Make Labels Adhere to Metals.—Water, 1 pt.; borax, 1 oz.; shellac, 5 oz.; boil until the latter is dissolved. Thin with boiling water. If necessary use hot.

Paste, London.—Mix equal parts of unslaked lime and caustic soda; mix intimately after reducing to a fine powder in a warm mortar. Keep the mixture in an air tight bottle and mix up with water as required for use.

Paste Paper.—Boil white paper in water for five hours; then pour off the water, and pound the pulp in a mortar; pass it through a sieve and mix with some gum water or isinglass glue. It is used in modeling.

Paper Hangers, Paste for.—We believe the best paper hangers' paste, as well as a paste for general purposes, is simply wheat or rye flour beaten in cold water to perfect smoothness, and the whole just brought to a boil, while being constantly stirred to prevent burning. A little creosote, or carbolic acid, will make it keep much better. Any addition to this paste fails to improve it.

Matrix, Paste for.—A correspondent once wrote: After considerable experiment I have succeeded in making a paste for matrices that gives us from 40 to 80 casts, average perhaps 50 to each matrix. I use two ounces of French gelatine dissolved in vinegar, then add to this 1 oz. alum and 1 qt. hot water. In a separate vessel dissolve 1 lb. starch in cold water. Then bring the water in which is dissolved the gelatine and alum to boiling point, and gradually stir in the dissolved starch, stirring all the time to prevent lumps. Boil half an hour, stirring all the time; when cold, to a pint of paste add water and 1 oz. of Spanish white to make matrix; use enough water to the paste so as to spread well.

Pasting and Folding Machine, Paste for.—Four parts, by weight, of glue are allowed to soften in 15 parts of cold water for some hours, and then moderately heated until the solution becomes quite clear; 65 parts of boiling water are now added, with stirring. In another vessel 30 parts of starch paste are stirred up with 30 parts of cold water, so that a thin milky fluid is obtained without lumps. Into this the boiling glue solution is poured, with constant stirring, and the whole is kept at the boiling temperature. After cooling, 10 drops of carbolic acid are added to the paste. This paste is of extraordinary adhesive power, and may be used for leather, cardboard, etc., as well as for paper. The paste in the reservoir should be kept from the air as much as possible to avoid loss of water by evaporation.

Pads, Paste for.—The composition is said to be prepared as follows: Glue, 4 lb.; glycerine, 2 lb.; linseed oil, ½ lb.; sugar, ¼ lb.; aniline dyes, q. s. to color. The glue is softened by soaking it in a little cold water, then dissolved together with the sugar in the glycerine, by aid of heat over a water bath. To this the dyes are added, after which the oil is well stirred in. It is used hot. Another composition of a somewhat similar nature is prepared as follows: Glue, 1 lb.; glycerine, 4 oz.; glucose sirup, about 2 tablespoonfuls; tannin, one-tenth oz. Give the compositions an hour or more in which to dry or set before cutting or handling the pads.

Paper, Paste for.—A ¼ of an oz. crude gutta percha dissolved in carbon disulphide to the consistency of mucilage. Apply to the edges of the paper where required.

Photographs, Paste for.—In the *Photographic Times* Mr. W. H. Gardner collects together a number of formulæ of various mountants, of which we give the following:

1. Gelatine Mountant.

Cooking gelatine	1 oz.
Alcohol, 95%	10 oz.
Glycerine	½ to 1 oz.

Soak gelatine in cold water for an hour or more, take out and drain off all the water which will go, add to alcohol in wide mouthed bottle. Add ½ to 1 oz. glycerine, according as gelatine is of a hard or soft kind. Put bottle in hot water, with occasional shaking, until gelatine is quite dissolved. Will keep indefinitely, and has only to be heated when wanted for use.

2. Nelson's No. 1 photographic gelatine

Gelatine	4 oz.
Water	16 oz.
Glycerine	1 oz.
Alcohol	5 oz.

Dissolve the gelatine in the water, then add the glycerine, and lastly the alcohol.

3. Permanent paste.

Arrowroot	10 parts.
Water	100 parts.
Gelatine	1 part.
Alcohol	10 parts.

Soak the gelatine in the water, add the arrowroot, which has first been thoroughly mixed with a small quantity of the water, and boil four or five minutes. After cooling add the alcohol and a few drops of carbolic acid or oil of cloves.

4. Another.—

Best Bermuda arrowroot	1¾ oz.
Sheet gelatine or best Russian glue	80 grn.
Water	15 oz.
Methylated spirit	1 oz.

Put the arrowroot into a small pan, add 1 oz. water and mix it thoroughly up with a spoon, or the ordinary mounting brush, until it is like thick cream; then add 14 oz. water and the gelatine broken into small fragments. Boil for four or five minutes, set it aside until partially cold, then add the methylated spirit and six drops of pure carbolic acid. Be very particular to add the spirit in a gentle stream, stirring rapidly all the time. Keep it in a corked stock bottle and take out as much as may be required for the time and work it up nicely with the brush.

5. Starch Paste.—Pour cold water on good laundry starch to barely moisten it. Then stir in cold water until proper consisteney is reached. Squeeze through canvas if not free from lumps. Starch paste should be freshly made for each batch of prints.

6. Allow 4 parts by weight of hard gelatine to soften in 15 parts of water for several hours, and then moderately heat until the solution is quite clear, when 65 parts of boiling water should be added while stirring. Stir in another vessel 30 parts starch paste with 20 parts cold water, so that a thin milky fluid is obtained without lumps. Into this the boiling gelatine solution should be poured while constantly stirring and the whole kept at a boiling temperature. When cool add to the whole 10 drops carbolic acid to prevent souring. This makes a very tenacious paste.

7. Casein Mucilage.—Heat milk with a little tartaric acid, whereby casein is separated. Treat the latter while still moist with a solution of 6 parts borax to 100 parts water and warm gently while stirring, which will cause the casein to be dissolved. Of the borax solution enough should be used to leave only a little undissolved casein behind.

8. Good Mounting Paste.—Add to 250 c. cm. concentrated gum solution, 2 parts gum to 5 parts water, a solution of 1 grm. sulphate alumina in 20 c. cm. water. Alum does not answer the purpose as well. The addition of the sulphate is effective, in that this gum is not so readily softened by moisture, and besides, wood can be fastened to wood by means of it. Its adhesive qualities are, in general, greater than those of pure gum arabic.

9. Impervious Paste.—Soak ordinary glue in water until it softens, remove it before it has lost its original shape, and dissolve in ordinary linseed oil on a gentle fire until it acquires the consistency of a jelly. This paste may now be used for all kinds of substances, as, besides strength and hardness, it possesses also the advantage of resisting the action of water.

10. Thin Mucilage.—A paste that will not draw engravings when pasted down on paper must be thin. A mixture of equal parts of gum tragacanth and gum arabic forms with water a thinner mucilage than either one alone.

11. Liquid Glue.—With any desired quantity of glue use ordinary whisky instead of water. Break the glue in small fragments and introduce these into a suitable glass vessel, and pour the whisky over them. Cork tightly, and set aside for three or four days, when it will be ready for use. The whisky must not be too strong, and a little heat is generally required.

12. Another.—Same as above, except that acetic acid is used in place of whisky, and that the bottle containing ingredients must be placed in hot water to dissolve the glue.

13. Another.—

Glue	8 oz.
Water	8 oz.
Nitric acid	2½ oz.

Dissolve the glue in the water by immersing vessel containing same in hot water. When solution is effected, add the acid. Effervescence will take place with the evolution of orange nitrous fumes. Now cool. It should be kept in a well stoppered bottle, and will remain permanently liquid.

Remarks.—As regards the formulæ collected by Mr. Gardner, we may remark, says the *Photo. Review*, that of the above, Nos. 13, 12, and 9 are quite unfit for mounting silver prints, although they may be useful for other work in the studio; Nos. 12 and 13 for cardboard and light woodwork, where the presence of acid is not likely to be detrimental; and No. 9 (which is really an emulsion of glue and linseed oil, and requires well beating together) for cementing articles likely to be exposed to damp. Strips of cloth used to make the developing room light-tight may well be cemented with No. 9, especially if 10 grn. finely powdered bichromate of potash be stirred into each ounce just before use.

The desirability of employing Nos. 7 and 8 as mountants for silver prints is open to doubt, although these are excellent for cementing all such ordinary materials as come under the denomination of stationery.

We thus have left adhesives Nos. 1, 2, 3, 4, 5, 6, and 10 as quite safe for silver prints if good materials are used, and do not become decomposed subsequently. Gelatinous mountants made with a considerable proportion of alcohol, like No. 1 or No. 11, have the advantage of not considerably stretching either mount or print, and are especially useful when prints (whether silver or Woodbury type) have to be mounted on thin card, as book illustrations. In the case of Nos. 2, 3, 4, the alcohol is used mainly as an antiseptic, and is not present in sufficient quantity to have much influence as a preventive of stretching or cockling. The simple starch paste, No. 5, is not satisfactory in all instances, owing to want of sufficient adhesion, in which case it is an excellent plan to adopt No. 6, in which starch and gelatine are used together.

14. The following has been suggested as a very desirable substitute for the ordinary pastes used for mounting photo. prints. It is said that it can be used so as to scarcely swell the paper at all, avoiding the objectionable cockling so much complained of:

Thick, well boiled, clear starch (corn) paste	1 lb.
Glucose sirup ("A" clear)	7 oz.
White curd soap	½ oz.
Dextrine, flowered	5 oz.
Borax	⅛ oz.
Clove oil	a few drops.

All are heated over the water bath, and thinned down to a proper consistence (if thin paste is required) with fresh skimmed milk. It is advisable to use the paste warm and as thick as possible.

15. Nelson's No. 1 photographic gelatine 1 gr.
Water 16 oz.
Glycerine 1 oz.
Methylated alcohol 5 oz.

Dissolve the gelatine in warm water, then add the glycerine, and finally the spirit.

Scrap Books, Paste for.—Rice starch, 1 oz.; gelatine, 3 drm.; water, ½ pt.; heat, with constant stirring, until the milky liquid becomes thick and glassy, when the paste is ready. Keep the paste in a tight bottle with a few drops of clove oil.

Skins, Glue or Paste for.—Get a pound of rye flour, put it in a basin and pour enough boiling water to make a stiff paste. It must be made almost as stiff as ordinary dough for puddings, but not quite. Stir, and beat up well with a stick for three or four minutes, then cover up, and put by for two days before using, when it

will be much softer and stick better. Spread thinly and evenly on back of skin with a stiff brush or pad; this will stick firmly and will not crack.

Stereotypers' Paste.—Take 5 oz. flour, 7 oz. white starch, a large tablespoonful powdered alum, and 4 qt. water. Put the flour, starch and alum into a saucepan, and mix with a little of the water, cold, until the whole becomes of the consistency of thick cream. Then gradually add the remainder of the water, which must be boiling, stirring well meanwhile to prevent lumps. Put the mixture over the fire, and stir until it boils; then let it stand until quite cold, when it should look like jelly. When you are ready for work add Spanish whiting, the mixture not to be too stiff to spread readily with the paste brush. Put through a fine wire sieve with a stiff brush, and it is ready for use.

Stickfast Paste.—

Wheaten flour	1	oz.
Powdered tragacanth	½	oz.
Powdered gum arabic	½	oz.
Salicylic acid	30	grn.
Oil of wintergreen	3	drops.
Water	12	oz.

Mix the powders and gradually add the water; then bring to the boil; allow to simmer for twenty minutes, stirring constantly. When cold add the oil.

Sugar and Lime Paste.—White sugar, 4 parts; water, 9 parts; slaked lime, 1 part. The lime is poured in after the sugar has been brought to the boiling point in the water. After standing for several days the thick liquid is poured off.

Tin Foil, Paste for Fastening Paper upon.—Make a paste by dissolving rye flour in a solution of caustic soda, dilute with water, stirring all the time. Add to this paste Venetian turpentine—a few drops for each ½ lb. flour. Adheres firmly to all metals, tin foil, glass, etc.

Pastils, Fumigating.—*Indian or Yellow.*—Santal wood in powder, 1 lb.; gum benzoin, 1½ lb.; gum tolu, ¼ lb.; otto of santal, otto of cassia, otto of cloves, of each 3 dr.; nitrate of potass., 1½ oz.; mucilage of tragacanth, q. s., to make the whole into a stiff paste. The benzoin santal wood and tolu are to be powdered, and mixed by sifting them, adding the ottos. The niter being dissolved in, the mucilage is then added. After well beating in a mortar the pastils are formed in shape with a pastel mould, and gradually dried.

The following are examples of these articles, from which the operator will be able to devise others:

1. Gum benzoin, powdered ..... 4 oz.
   Cascarilla, powdered ..... 1 oz.
   Niter, powdered ..... ½ oz.
   Gum tragacanth, powdered ..... 3 dr.
   Charcoal, powdered ..... ½ lb.
   Oil of nutmeg ..... ½ fl. dr.
   Oil of cloves ..... ½ fl. dr.

beat them to a stiff, ductile mass, with
Cold water ..... q. s.

mould it and dry the pastils by exposure to the air. The product may be varied by omitting one, or both, the essential oils; or by the addition of a little styrax (liquid or in tears), or balsam of Peru. Some persons add 1 to 2 dr. of myrrh.

2. Gum benzoin ..... 4 oz.
   Sandal wood, white ..... 1 oz.
   Balsam of tolu ..... 1 oz.
   Gum arabic ..... ½ oz.
   Niter ..... ½ oz.
   Gum tragacanth ..... ¼ oz.
   Labdanum, true ..... ¼ oz.
   Charcoal, linden ..... 12 oz.
   Cinnamon water, to mix ..... 12 oz. or q. s.

and proceed as before. This is the formula of MM. Henry and Guibourt. That of the Paris Codex is similar, except that the powdered tragacanth and gum arabic are omitted and the mass beaten up with thin mucilage of tragacanth, instead of with cinnamon water.

3. Gum benzoin ..... 2 oz.
   Olibanum, in tears ..... 1½ oz.
   Styrax, in tears ..... 1 oz.
   Cascarilla ..... ¾ oz.
   Gum tragacanth ..... ¾ oz.
   Niter ..... 2 oz.
   Charcoal ..... 1¼ lb.

mix and beat them up with water or rose water.

4. Charcoal ..... 1½ lb.
   Niter ..... 2 oz.
   Gum tragacanth ..... 1 oz.

mix in the dry state. It is used as a basis for the following French pastils, as well as many others:

5. Pastilles aux Fleurs d'Oranges.—To each lb. of No. 3 or 4 add of—
   Orange powder, genuine ..... 2½ oz.
   Neroli ..... 1 fl. dr.

and beat up the mass with eau de fleurs d'Oranges.

6. Pastilles à la Rose.—To each lb of No. 3 or 4 add of—
   Pale rose powder ..... 3 oz.
   Essence of roses ..... 2 fl. dr.

and beat up the mass with eau de rose.

7.—Pastilles à la Vanille.—To each lb. of No. 3 or 4, usually the first, add of—
   Vanilla, in fine powder ..... 2 oz.
   Cloves, in fine powder ..... ½ oz.
   Essence of vanilla ..... ½ fl. oz.
   Oil of cloves ..... ½ fl. dr.
   Oil of cassia ..... ½ fl. dr.

and beat up the mass with cinnamon water.

The *Druggists' Circular* gives the following recipes, both of which are excellent:

1. Take benzoin ..... 2 oz.
   Balsam of tolu ..... 4 dr.
   Yellow sandal wood ..... 4 dr.
   Niter ..... 2 dr.
   Labdanum ..... 1 dr.
   Charcoal ..... 6 oz.

Mix with a solution of gum tragacanth, and divide the mass into pastilles, cone shaped, and dry them in the air. The foregoing is the formula of the Paris Codex.

2. Take benzoin ..... 4 oz.
   Cascarilla ..... ½ oz.
   Niter ..... 3 dr.
   Gum arabic ..... 3 dr.
   Myrrh ..... 1 dr.
   Oil of nutmeg ..... 25 drp.
   Oil of cloves ..... 25 drp.
   Charcoal ..... 7 oz.

All in fine powder. Beat them to a smooth mass with cold water, q. s., and form into small cones and dry in the air.

Fumigating Rods.—1. Gum benzoin, 6 parts; balsam of tolu and powdered sandal wood, each 4 parts; powdered tragacanth and labdanum, each 1 part; powdered niter and gum arabic, each 2 parts; cinnamon, 12 parts; light charcoal (linden), 48 parts. Form into smooth ductile mass by aid of heat, mould and cool.

2. Gum benzoin, olibanum, and styrax (tears), each 12 oz.; niter, 9 oz.; charcoal, 4 lb.; moistened with solution of 2 oz. tragacanth in 1 qt. of rose water. To this may be added, if desired, essence of roses, pure neroli or orange powder, 1 oz. Oils of cloves and nutmeg, essence of vanilla, cascarilla, etc., are sometimes added in addition to the foregoing.

A Cheap Fumigator.—The following will be found to be a cheap and pleasant fumigator for sick rooms, diffusing a healthful, agreeable and highly penetrating disinfectant odor in close apartments, or wherever the air is deteriorated. Pour common vinegar on powdered chalk until effervescence ceases, leave the

whole to settle, and pour off the liquid. Dry the sediment and place it in a shallow earthen or glass dish, and pour upon it sulphuric acid until white fumes commence arising. This vapor quickly spreads, is very agreeably pungent, and acts as a powerful purifier of vitiated air.

Pastils (Piesse's).—Willow charcoal, ½ lb.; benzoic acid, 6 oz.; otto of thyme, otto of caraway, otto of rose, otto of lavendar, otto of cloves, otto of santal, of each ½ drm.; grain musk, 1 drm.; pure civet, ¼ drm. Prior to mixing dissolve ¾ oz. niter in ½ pt. of distilled water; with this solution thoroughly wet the charcoal and then allow it to dry in a warm place. When well mixed by sifting, it is finally beaten up in a mortar, with enough mucilage to bind the whole together; the less that is used the better.

Fumigating Pastils for Mosquitoes.—

Charcoal	1 lb.
Saltpeter	2 oz.
Carbolic acid	1½ oz.
Persian insect powder	8 oz.
Tragacanth mucilage	q. s.

Incense.—

1. Olibanum (true)	7 parts.
Gum benzoin	2 parts.

Mix.

2. To the last add of—

Cascarilla	1 part.

The preceding, placed on a hot iron plate or burned in a censer, were formerly used to perfume apartments. The incense used in the rites of the Roman Catholic Church and in the temples of India consists wholly or chiefly of olibanum.

Incense Powders.—Santal wood powder, 1 lb.; cascarilla bark powder, ½ lb.; benzoin, ½ lb.; vitivert, 2 oz.; nitrate of potass (saltpeter), 2 oz.; grain musk, ¼ drm. Sift the whole well together several times through a fine sieve.

Perfume Lamps.—Eau a Bruler.—Hungary water or eau de cologne, 1 pt.; tincture of benzoin, 2 oz.; tincture of vanilla, 1 oz.; otto of thyme, otto of mint, otto of nutmeg, of each, ½ drm.

Eau pour Bruler.—Alcohol, 1 pt.; benzoic acid, ½ oz.; otto of thyme, otto of caraway, of each, 1 drm.; otto of bergamot, 2 oz.

Opium Pastils.—Saltpeter 450 parts; pulverized althea, 450 parts; pulverized opium, 29¼ parts. Mix with water to form a paste. Make into pastils.

Ribbon of Bruges.—

1. Orris tincture	¼ pt.
Gum myrrh	½ oz.
Gum benzoin	2 oz.
2. Alcohol	¼ pt.
Pod musk	¼ oz.
Otto rose	½ drm.

Cork both bottles and leave them one month. Take 100 yd. of cotton tape and dip it in a hot solution; saltpeter, 1 oz.; water, ½ pt.; dry it. Filter the two tinctures, mix, dip tape in it, and dry it. It is then ready for use.

Tar Pastils.—Saltpeter, 420 parts; pulverized althea, 420 parts; tar, 360 parts. Form into a paste without water.

Turkish Pastil Lozenges.—For the use of smokers, or to prevent the taste of medicine. Fine sugar, 4 lb.; citric acid, 4 drm.; otto of roses, 5 drops; grain musk, 4 grn.; otto of vitivert, ½ drm. Gum tragacanth dissolved in water, enough to form the whole into a paste, tinted with liquid lake.

Pastilles, Mouth. See **Breath.**

Pâte-sur-Pâte.—Term applied to slip painting. This decoration is much used in France.

Patterns, Composition for. See **Compositions.**

Patterns, Varnish for. See **Varnishes.**

Pearls, to Clean. See **Cleansing.**

Pearl Buttons, to Dye. See **Dyeing.**

Pearl, Mother of, Imitation—1. Small articles may be made of imitation mother of pearl by producing the articles in horn, which is boiled in a solution of sugar of lead, and then laid in very dilute hydrochloric acid.

2. Combs, to which the boiling process is not applicable, as it distorts the teeth, may be treated by being kept overnight in a moderately concentrated cold solution of nitrate of lead, then laid for a quarter to half an hour in a bath containing 3% nitric acid, and finally being rinsed in water. The use of sugar of lead is, however, prejudicial, and should be avoided.

To give to Articles the Luster of Mother-of-Pearl.—Make a solution of copal, 1 part; sandarac, 1 part; solution of dammar, 2 parts; rosin, ½ part; absolute alcohol, ½ part. Mix these ingredients with ¼ their volume of oil of bergamot or rosemary. Distill until it is reduced to the consistency of castor oil. Take a vessel which is a little larger than the article to be coated; fill with water to which has been added about 5% of pure glue solution. Apply the varnish with a feather or brush to the surface of the water; a beautiful iridescent film will be formed, which is laid on the articles to be made iridescent. Keep the water at a temperature of about 70° F.

Pearls, to Polish. See **Polishing.**

Pearl Powders. See **Powders.**

Pearl, Working of.—There are two kinds of shells used in the manufacture of small articles; the porcelainous and the nacreous. The former are extremely hard, and can be worked only with the apparatus employed by the lapidary. The latter are more generally used, and may be sawn, filed, and turned, with some facility. The pieces should be roughed out on a common grindstone. After turning, they should be smoothed with pumice stone and water, and polished with rotten stone wet with sulphuric acid slightly diluted.

Pencils, *Aniline.*—The materials used are aniline, graphite, and kaolin, in different proportions. Made into a paste with cold water, they are pressed through a screen that divides the mass into slender sticks used in filling the pencils. When dry the sticks are fitted to the wooden parts, and glued together in the usual way. They may be used in copying, marking in permanent color, and in reproducing writing or designs. In copying a thin sheet of moistened paper is laid over the letter, design or document, and the lines are traced with the pencils. The action of the water on the aniline gives a deep, fast tracing, resembling ink in color. On ordinary dry paper they give a mark which cannot be removed by India rubber. Moistened sheets of paper laid over the writing under a slight pressure will transfer good impressions that do not blurr.

A Benzine Pencil.—A device recently patented in England for the purpose of removing grease from gloves or fabrics (*Pharmaceutical Era*) consists of a cylindrical body about the size of an ordinary lead pencil, containing benzine. At each end there is a thick piece of felt, one piece being intended to be moistened by the benzine, while the other end of the pencil is kept perfectly dry to take up the superfluous moisture. The device is said to be very handy and useful.

Pencils, Colored, for Glass.—The following formulas for the composition of pencils for sketching on glass, porcelain, etc., are those used at the factory of A. W. Faber, of Stein, near Nürnberg, Germany:

1.—Black.—

Lampblack	10 parts.
White wax	40 parts.
Tallow	10 parts.

2.—White.—

Zinc white	40 parts.
White wax	20 parts.
Tallow	10 parts.

3.—Light Blue.—

Prussian blue	10 parts.
White wax	20 parts.
Tallow	10 parts.

4.—Dark Blue.—

Prussian blue	15 parts.
Gum arabic	5 parts.
Tallow	10 parts.

5.—Yellow.—

Chrome yellow	10 parts.
Wax	20 parts.
Tallow	10 parts.

The colors are mixed with the fats in warmed vessels, levigated with the same, and are then allowed to cool until they have acquired the proper consistency for being transferred to the presses. In these the mass is treated and shaped similarly as the graphite in the presses for ordinary pencils.

Indelible Pencils.—1. Reduce nitrate of silver to an impalpable powder, add just enough lampblack to give it a black color and enough of a thick solution of gum arabic in hot water to make the powder coherent. Rub these ingredients well together, form into thin sticks and dry.

2. Kaolin	8 parts.
Finely powdered manganese dioxide	2 parts.
Silver nitrate	3 parts.

Mix and knead intimately with 5 parts distilled water, then dry the mass and inclose it in wood. Transfer paper is made by rubbing white paper with a composition of 2 oz. tallow, ½ oz. powdered black lead, ¼ pt. linseed oil and sufficient lampblack to make it of consistency of cream. These should be melted together and rubbed while hot on the paper. When dry it will be fit for use.

Indelible Pencil Writing.—Lay the writing in a shallow dish and pour skimmed milk upon it. Any spots not wet at first may have the milk placed upon them lightly with a feather. When the paper is wet all over with the milk take it up and let the milk drain off and remove with the feather the drops which collect on the lower edge. Dry carefully.

Cutting Pencils.—If the point is intended for sketching it is cut equally from all sides, to produce a perfectly acute cone. If this be used for line drawing the tip will be easily broken, or otherwise it soon wears thick; thus, it is much better for line drawing to have a thin flat point. The general manner of proceeding is, first, to cut the pencil, from two sides only, with a long slope, so as to produce a kind of chisel end, and afterward to cut the other sides away only sufficient to be able to round the first edge a little. A point cut in the manner described may be kept in good order for some time by pointing the lead upon a small piece of fine sandstone or fine glass paper; this will be less trouble than the continual application of the knife, which is always liable to break the extreme edge.

Faber's Pencils.—Faber's pencil for copying writing or designs is made of different degrees of hardness, and is stated by the inventor to combine all the advantages of the very best lead pencils. Four kinds are manufactured. No. 1, very soft; composed of 50 parts aniline, 37·5 parts graphite and 12·5 kaolin. No. 2, soft; 46 parts aniline, 34 parts graphite, 24 parts kaolin. No. 3, hard; 30 parts aniline, 30 parts graphite, 40 parts kaolin. No. 4, very hard; 25 parts aniline, 25 parts graphite, 50 parts kaolin. These materials are pounded and mixed with the greatest care, and afterward made into a paste with cold water. After the paste has been well worked and rendered perfectly homogeneous, it is passed through a wire screen, which divides it into strips of suitable dimensions. These are dried in an ordinary room, and afterward fitted and glued into wooden cases like common lead pencils.

Pencil Marks, to Fix.—1. To a saturated solution of alum in pure water, add as much fish glue, isinglass, as may form a size of the proper consistency, which can only be regulated by the character of the drawing for which it is intended. Let the solution stand for about thirty-six hours, after which it should be boiled, and when cold, passed through a linen cloth. Add about an equal quantity of some colorless spirits or diluted alcohol. Put the solution in a dish or wooden tray and, holding the drawing horizontally, face downward, gently immerse it therein, and almost immediately lift it out, without changing its horizontal position, in which it must remain till dry.

2. To 1 part dammar varnish add 25 parts turpentine. Flow the drawings with this and let them dry. Or use skimmed milk and water mixed in equal parts, applied with a brush.

New Pencil as a Substitute for Ink.—We do not refer here to the aniline pencils, which have been in use for some time, but to a quite different pencil, which gives a very black writing, capable of being reproduced by the copying machine, and which does not fade on exposure to light. The mass for these pencils is prepared as follows: 10 lb. of the best logwood are repeatedly boiled in 10 gal. water, straining each time. The liquid is then evaporated down till it weighs 100 lb., and is then allowed to boil in a pan of stoneware or enamel. To the boiling liquid nitrate of oxide of chrome is added in small quantities, until the bronze-colored precipitate formed at first is redissolved with a deep blue coloration. This solution is then evaporated in the water bath down to a sirup, with which is mixed well kneaded clay in the proportion of 1 part of clay to 3½ of extract. A little gum tragacanth is also added to obtain a proper consistence.

It is absolutely necessary to use the salt of chrome in the right proportion. An excess of this salt gives a disagreeable appearance to the writing, while if too little is used the black matter is not sufficiently soluble.

The other salts of chrome cannot be used in this preparation, as they would crystallize, and the writing would scale off as it dried.

The nitrate of oxide of chrome is prepared by precipitating a hot solution of chrome alum with a suitable quantity of carbonate of soda. The precipitate is washed till the filtrate is free from sulphuric acid. The precipitate thus obtained is dissolved in pure nitric acid, so as to leave a little still undissolved. Hence the solution contains no free acid, which would give the ink a dirty red color. Oxalic acid and caustic alkalies do not attack the writing. Dilute nitric acid reddens, but does not obliterate the characters.—*Moniteur Scientifique.*

Pencils for Marking Linen.—Mix 4 parts powdered pyrolusite with 16 parts of thoroughly dried alumina. Add to this a solution of 6 parts nitrate of silver in 10 parts distilled water. Rub and knead the mass thoroughly. Pencils are formed from this and dried. Used for marking linen.

Pencils, Striping.—To keep striping pencils in good shape and ready for use, grease them with tallow from a candle and spread the hair straight on a piece of glass: keep them preserved from dust.

Peppermint Cordial. See **Liquors.**

Percolation, or Displacement.—This is the neatest and most rapid process for extracting the soluble principles from vegetable substances, and is the method directed in the U. S. *Pharmacopœia* for preparing a large number of the officinal tinctures, wines, vinegars, sirups, extracts and some of the infusions. It is necessary that the articles to be acted upon should first be reduced to the condition of a coarse

powder; then mix them together in the proportions demanded by the recipe, and moisten the mass thoroughly with alcohol, allowing it to macerate for twelve hours in a well covered vessel Next introduce them into the percolator, and slightly press them upon the partition. Any portion of the liquid used in the maceration, not absorbed by the powder, should be poured upon the mass in the instrument and allowed to percolate. Next gradually pour into the percolator sufficient of the alcohol, or other liquid to be filtered, to drive before it or displace the liquid contained in the mass. The portion introduced must in like manner be displaced by another portion, and so on until the required quantity of filtered liquor is obtained. If the liquor which first passes through is thick and turbid, introduce it again into the instrument, being careful not to have the powder too coarse or loosely pressed, or it will permit the liquid to pass too quickly; on the other hand, it should not be too fine and compact, or it will offer an unnecessary resistance. Should the liquor flow too rapidly return it to the instrument, and close it beneath for a time, and thus permit the finer parts of the powder to subside, and cause a slower percolation. When substances are glutinous or mucilaginous, mix the powder with an equal bulk of well washed sand before rubbing it up with the menstruum.

Perfumery.—The perfumes for the toilet are either simple or compound; the former are called extracts or essences and the latter bouquets. Unfortunately the language of the perfumer is French, and this has led to many mistakes in classification, and the terms *extraits, esprits, eaux* and *parfumes* are very loosely applied. Some works call essential oils ottos or essences, and the confusion is so great that the different terms will be properly defined; but in the receipts no attempt has been made to separate them into classes, and they are arranged alphabetically according to the flowers or name. By far the larger number of the materials used by the perfumer come from the vegetable kingdom, but there are some exceptions, as ambergris, musk and civet. The number of flowers used by the perfumer is very limited, but, by a judicious combination, or rather blending, almost any odor may be obtained.

The odors of plants reside in different parts of them, sometimes in the roots, as in the iris and vitivert; the stem or wood, in cedar and santal; the leaves, in mint, patchouly, and thyme; the flower, in the roses and violets; the seeds, in the Tonquin bean and caraway; the bark, in cinnamon, etc.

Some plants yield more than one odor, which are quite distinct and characteristic. The orange tree, for instance, gives three; from the leaves one called *petit grain;* from the flowers we procure *neroli;* and from the rind of the fruit, essential oil of orange, named *Portugal.* On this account, perhaps, this tree is the most valuable of all to the operative perfumer.

The fragrance or odor of plants is owing, in nearly all cases, to a perfectly volatile oil, either contained in small vescels, or sacs, within them, or generated from time to time, during their life, as when in blossom. Some few exude, by incision, odoriferous gums, as benzoin, olibanum, myrrh, etc.; others give, by the same act, what are called balsams, which appear to be mixtures of an odorous oil and an inodorous gum. Some of these balsams are procured in the country to which the plant is indigenous by boiling it in water for a time, straining, and then boiling again, or evaporating it down till it assumes the consistency of treacle. In this latter way is balsam of Peru procured from the *Myroxylon peruiferum*, and the balsam of Tolu from the *Myroxylon toluiferum.* Though these odors are agreeable, they are not much applied in perfumery for handkerchief use, but by some they are mixed with soap, and in England they are valued more for their medicinal properties than for their fragrance.

The odors of flowers are more generally secreted during the sunshine, or at least in the daytime, but there are some which yield no odor in the day, but are very fragrant in the evening, such as the *Cestrum nocturnum*, the *Lychnis vespertina*, some of the *Catasetum* and the *Cymbidium.*

Ottos from Plants.

Quantities of Ottos, Otherwise Essential Oils, Yielded by Various Plants.—

	lb.		of otto.
Orange peel	10	yield about	1 oz.
Dry marjoram herb	20	"	3 oz.
Fresh marjoram herb	100	"	3 oz.
Fresh peppermint	100	" 3 to	4 oz.
Dry peppermint	25	" 3 to	4 oz.
Dry origanum	25	" 2 to	3 oz.
Dry thyme	20	" 1 to	1½ oz.
Dry calamus	25	" 3 to	4 oz.
Anise seed	25	" 9 to	12 oz.
Caraway	25	"	16 oz.
Cloves	1	"	2½ oz.
Cinnamon	25	"	3 oz.
Cassia	25	"	3 oz.
Cedar wood	28	"	4 oz.
Mace	2	"	3 oz.
Nutmegs	2	" 3 to	4 oz.
Fresh balm herb	60	" 1 to	1½ oz.
Cake of bitter almond	14	"	1 oz.
Sweet flag root	112	"	16 oz.
Geranium leaves	112	"	2 oz.
Lavender flowers	112	" 30 to	32 oz.
Myrtle leaves	112	"	5 oz.
Patchouly herb	112	"	28 oz.
Provence rose blossom	112	" 1½ to	2 dr.
Rhodium wood	112	" 3 to	4 oz.
Santal wool	112	"	30 oz.
Vitivert or kuskus root	112	"	15 oz.
Violets	112	"	½ dr.

Boiling and Congealing Temperatures of Various Ottos, etc.—

	Fahr.
Almond oil will not boil	660°
Otto of patchouly boils	515°
" vitivert	548°
" santal wood boils	550°
" cedar wood boils	507°
" English lavender boils	475°
" lemon grass boils	440°
" rose (pure Turkish) boils	432°
" geranium (Spanish) boils	430°
" geranium (Indian) boils	420°
" gaultheria boils	400°
" almonds boils	356°
" bergamot (pure) boils	370°
" caraway boils	348°
" lemon peel boils	345°
" orange peel boils	345°
" French lavender (spike)	180°
" white wax melts	150°
" camphor sublimes	145°
" spermaceti melts	112°
" paraffine A	102°
" paraffine B	90°
" otto rose (Italian) congeals	62°
" otto rose (Turkish) congeals	58°
" geranium, neroli, cloves, deposit crystals	2°
" santal, cedar, lemon grass, congeal to a jelly	— 5°
" bergamot congeals	—12°
" cinnamon still fluid	—13°

Perfumes are extracted from plants as follows: From the flowers by enfleurage, absorption or maceration; from the roots by trituration; and by distillation from the seeds.

The processes are divided into four distinct operations, viz., 1, expression; 2, distillation; 3, maceration; 4, absorption.

1. Expression is only adopted where the plant is very prolific in its volatile or essential oil, *i. e.*, its odor, such, for instance, as is found in the pellicle or outer peel of the orange, lemon

and citron, and a few others. In these cases, the parts of the plant containing the odoriferous principle are put sometimes in a cloth bag and at others by themselves into a press, and by mere mechanical force it is squeezed out. The press is an iron vessel of immense strength, varying in size from 6 in. in diameter and 12 in. deep, and upward, to contain one hundred weight or more; it has a small aperture at the bottom to allow the expressed material to run for collection; in the interior is placed a perforated false bottom, and on this the substance to be squeezed is placed, covered with an iron plate fitting the interior. This is connected with a powerful screw, which, being turned, forces the substance so closely together that the little vessels containing the essential oils are burst, and it thus escapes. The common tincture press is indeed a model of such an instrument. The oils which are thus collected are contaminated with watery extract, which exudes at the same time and from which it has to be separated; this it does by itself to a certain extent, by standing in a quiet place, and it is then poured off and filtered when requisite.

2. Distillation.—The plant or part of it which contains the odoriferous principle is placed in an iron, copper or glass pan, varying in size from that capable of holding from 1 to 20 gal., and covered with water; to the pan a dome shaped lid is fitted, terminating with a pipe, which is twisted corkscrew fashion and fixed in a bucket with the end peeping out like a tap in a barrel. The water in the still—for such is the name of the apparatus—is made to boil; and having no other exit the steam must pass through the coiled pipe, which being surrounded with cold water in the bucket, condenses the vapor before it can arrive at the tap. With the steam the volatile oil, *i. e.*, perfume, rises and is liquefied at the same time. The liquids which thus run over, on standing for a time, separate into two portions and are finally divided with a funnel having a stop cock in the narrow part of it. By this process the majority of the volatile ottos are procured. In some few instances alcohol is placed upon the odorous materials in lieu of water, which, on being distilled, comes away with the perfuming substance dissolved in it. But this process in now nearly obsolete, as it is found more beneficial to draw the oil or essence, first, with water, and afterward to dissolve it in the spirit. The low temperature at which spirit boils compared with water causes a great loss of otto, the heat not being sufficient to disengage it from the plant, especially where seeds, such as cloves or caraway, are employed.

3 Maceration.—This operation is conducted thus: For what is called pomade, a certain quantity of purified beef or deer suet, mixed with purified lard, is put into a clean metal or porcelain pan; this being melted by a steam heat or bath, the kind of flowers required for the odor wanted are carefully picked and put to the liquid fat, and allowed to remain from twelve to forty-eight hours; the fat has a particular affinity or attraction for the otto of flowers, and thus, as it were, draws it out of them, and becomes itself, by their aid, highly perfumed; the fat is strained from the spent flowers, and fresh are added ten or fifteen times over, till the pomade is of the required strength; these various strengths of pomatums are noted by the French makers as Nos. 6, 12, 18, and 24, the higher numerals indicating the amount of fragrance in them. For perfumed oils, the same operation is followed; but, in lieu of suet, fine olive oil, and the same results are obtained. These oils are called huile antique of such and such a flower.

The orange, rose, and cassie compounds are principally prepared by this process.

The violet and rézéda pomades and oils are prepared first by the maceration process, and then finished by *enfleurage*.

When neither of the three foregoing processes gives satisfactory results, the method of procedure adopted is by—

4. Absorption or Enflurage.—Of all the processes for procuring the perfumes of flowers, this is the most important to the perfumer, and is the least understood in England; as this operation yields not only the most exquisite essence indirectly, but also nearly all those fine pomades known here as "French pomatums," much admired for their strength of fragrance, together with "French oils," equally perfumed. The odors of some flowers are so delicate and volatile that the heat required in the previously named processes would greatly modify, if not *entirely* spoil, them; this process is, therefore, conducted cold, thus: Square frames, called a *châssis*, about three inches deep, with a glass bottom, say two feet wide and three feet long, are procured; over the glass a layer of fat is spread, about a quarter of an inch thick, with a kind of plaster knife or spatula; on this the flower buds are sprinkled, completely over it, and there left from twelve to seventy-two hours.

For oils of the same plants, coarse cotton cloths are imbued with the finest olive oil, and laid upon a frame containing wire gauze in lieu of glass; on these the flowers are laid, and suffered to remain till fresh flowers are procured.

This operation is repeated several times, after which the cloths are subject to a great pressure, to remove the now perfumed oil.

But for the pharmacist and the amateur, who desire to make only small quantities, the better and in fact the only way is, to buy the essential oils and prepare the perfume with their aid, as this requires no large plant or expenditure of capital. Care should be used to get deodorized alcohol, and all materials should be purchased of large drug houses who make a specialty of the expensive essential oils. The prices which are given in some receipts are only approximate and were taken with the original receipt.

Bouquets.—Perfumes where the odor of no one flower can be discovered as predominating over another.

Esprits.—The name *esprits* is commonly given by the perfumers to alcoholic solutions of the fragrant essential oils and other odorous and aromatic substances. As a rule, esprits are less highly charged with odorous principles, and have less alcoholic strength than essences and extraits, as well as having little color, if any; but the term is often very loosely and capriciously applied in trade, just as its synonym or analogue, spirit, is in English.

Essences.—The term essence is commonly very loosely applied to preparations that differ greatly from each other, and which are presumed or pretended to contain the essential principles or qualities of anything disincumbered of grosser matter. Thus, the essential or volatile oils obtained from vegetable substances, by distillation, are frequently called essences, as well as a strong solution of them in rectified spirit—a system of nomenclature which continually leads to confusion and mistakes. In pharmacy, the concentrated infusions, decoctions, liquors, solutions, and tinctures, are also frequently called essences by those who vend them. In perfumery, a similar loose application of the term prevails; but it is more particularly appropriated to concentrated, or somewhat concentrated, alcoholic solutions of the essential oils and other fragrant substances, whether obtained by simple admixture, by distillation, or by digestion as in making tinctures. Indeed, the fragrant essences of the perfumers differ from their eaux, esprits, tinctures, and other forms of perfumed spirits merely in their greater richness in the odorous principles that characterize them, and the greater strength of the spirit that holds these principles in solution.

Extraits, Extracts.—In French perfumery, these are, appropriately, strong spirituous so-

lutions, either simple or compound, of the essential oils and odorous principles of plants, and other substances obtained by infusion or digestion, as distinguished from those that are obtained by distillation and direct solution. Under the term, however, are often classed many perfumes prepared with rectified spirit by the latter methods, and which are highly charged with the fragrant matter, or matters, which they represent.

The preparation of most of the *extraits* is simple enough, the chief care necessary being that the spirit be absolutely scentless and of sufficient strength, and that the oils, and other materials, be recent and perfectly pure. With some flowers of extremely delicate perfume, highly perfumed spirit of the finest quality cannot well be obtained either by infusion or distillation, or by simple solution of the respective essential oils; or, at least, they are not usually so prepared by the Continental perfumers, who are undoubtedly the best judges in such matters. For these, an entirely different and a rather tedious and indirect method is pursued. Pure rectified spirit is digested, for three or four days, on half its weight of the oils or pommades obtained by infusion or contact from the respective flowers. The operation is performed in a securely closed vessel or digester of porcelain or tinned copper, set in a water bath, frequent agitation being employed during the whole time. After the whole has become quite cold, the vessel is opened, and the perfumed spirit carefully decanted into a second similar vessel or digester, containing a like quantity of oil to the first one. The whole process is then repeated a second time; and again a third time, with fresh oil or pommade. Finally, the cold spirit, after sufficient repose, is very carefully decanted through a glass or porcelain funnel stopped with a small wad of cotton wool, into the receiver or store bottle.

Alcohol.—One of the first requisites in the manufacture of good perfumes is pure alcohol, free from fusel oil or other foreign flavor. The purer grade of spirit is known in commerce as pure spirits, silent spirits, or deodorized alcohol, and may readily be distinguished from ordinary alcohol by the absence of that peculiar pungency of odor which is present to a greater or less extent in most commercial samples.

Esprit d'Acacia.—

Esprit de fleurs d'acacia (simple)	7	fl. oz.
Esprit de fleurs jasmin	1½	fl. oz.
Esprit de tuberose	1½	fl. oz.
Essence of ambergris (finest, pale)	1	fl. drm.
Eau de fleurs d'oranges	3	fl. oz.
Rectified spirit	7½	fl. oz.

Mix. A favorite Italian perfume.

Alhambra Perfume.—Extract tuberose, 1 pt.; extract geranium, ½ pt.; extract acacia, ¼ pt.; extract fleur d'orange, ¼ pt.; extract civet, ¼ pt.

Esprit d'Amande. Almond Perfume.—

Essential oil of almonds	2½ fl. dr.
Oil of bergamot	½ fl. dr.
Oil of cassia	½ fl. dr.
Essence royale	½ fl. dr.
Rectified spirit	1 pt.

Mix.

Ambergris.—This substance, which is found floating in the sea, or is thrown up by the waves upon the shores of various countries, is now generally believed to be produced in the intestines of the sperm whale. The best gray ambergris is quite expensive, but is the only one worth buying.

Tincture of Ambergris.—

1. Ambergris	2	dr.
Powdered orris root	2	dr.
Deodorized alcohol	16	oz.

Grind the ambergris and orris in a mortar until reduced to a fine powder, transfer to a bottle, and add the alcohol. Marcerate for thirty days, and filter through paper.

2. Ambergris (gray)	30	gr.
Orris root (powdered)	1	dr.
Alcohol	8	oz.

Beat the ambergris with the orris root to a powder, then add the alcohol and macerate for thirty days, with occasional agitation, and filter.

Ambergris Extract.—

Spirit of rose	3	oz.
Tincture of ambergris	8	oz.
Tincture of musk	4	oz.
Tincture of vanilla	1	oz.

Cost, about $6.00 per pt. Where permanence is desired, this can be recommended.

Essence of Ambergris.—

1. Ambergris	5	drm.
Grain musk (Tonquin or Chinese, pure)	1½	drm.
Essence d'ambrette (or purple sweet sultan)	1	qt.

This produces the finest quality of the West End and Paris houses.

2. Ambergris	½	oz.
Grain musk (finest)	45	grn.
Essence d'ambrette	1	qt.

As before. Very fine.

3. Ambergris	½	oz.
Grain musk	12	grn.
Rectified spirit (56 o. p.)	1	pt.
Liquor of ammonia (0·880)	½	fl. drm.

Proceed as for No. 1 (above). Good. It forms the ordinary essence of the shops.

4. As the last, but replacing the liquor of ammonia with—

Oil of cloves	15 drops.
Balsam of Peru	15 drops.
Neroli	20 drops.

Or with—

Essence of roses	¼ pt.
Eau de fleurs d'oranges	¼ pt.

at will.

Almond (Amygdala Amara).—Is a native of Persia, Syria and Barbary, and is cultivated in southern France and Italy.

Almond Spirit.—

Oil of bitter almonds	80 drops.
Deodorized alcohol	16 oz.

Procure the best cologne spirits or deodorized alcohol obtainable. Do not use common alcohol, as its odor is too strong and pungent for perfumers' use.

Benzoic Acid.—Only that prepared from gum benzoin should be used.

Benzoin (Benzoinum).—Benzoin is imported from Borneo, Java and Siam. The tincture of benzoin has the property of adding permanence to some of the more fleeting odors.

Tincture of Benzoin.—

Gum benzoin, in fine powder	2	oz.
Deodorized alcohol	16	oz.

Macerate for thirty days, and filter.

Bergamot (Citrus Bergamia).—The oil is obtained in Italy by expression from the peel of the fruit. It should be kept in a dark place, and in a tightly corked bottle. If not well taken care of it soon loses its green color, becomes cloudy from a deposit of resin, and acquires a turpentine smell. Care should be taken to preserve all oils as above directed.

Essence of Bergamot.—The popular name of oil of bergamot. A spirituous essence may be made in a similar way to that of almonds.

Sweet Brier.—Add to geranium, No. 2:

Verbena extract, No. 1	1	pt.

Bouquets.—Essence Bouquet.—

1. Rose spirit	4	oz.
Ambergris tincture	1	oz.
Orris	2	oz.
Bergamot oil	¼	oz.
Lemon oil	⅛	oz.
2. Rose spirit	2	oz.
Ambergris tincture	2	drm.
Orris tincture	1	oz.
Bergamot otto	1	drm.
Lemon otto	15	min.

Cost, $1.32 per pint.

3. Oil leaf geranium	1	oz.
Oil Turkish geranium	½	oz.
Otto rose	1	drm.
Extract musk	6	oz.
Extract tonka	6	oz.
Extract orange flower	5	oz.
Extract vanilla	2	oz.
Extract civet	1	oz.
Alcohol	1	gal.
Water	4	oz.
4. Extract musk	2	oz.
Extract tuberose	2	oz.
Otto rose, virgin	1	drm.
Otto bergamot	1¼	drm.
Otto neroli super	½	drm.
Otto verbena (true)	8	min.
Otto pimento	10	min.
Otto patchouly	3	min.
Otto red cedar wood (true)	½	drm.
Otto lavender (English)	12	min.
Pure spirit, sufficient to make 4 pt.		

Bouquet d'Amour.—

Esprits de rose	2	oz.
Jasmine	2	oz.
Violette	2	oz.
Cassie	2	oz.
Essences of musk	1	oz.
Ambergris	1	oz.

Mix, and, if the liquid be not quite clear, add of strong alcohol, drop by drop, the least quantity sufficient to render it so. It may be filtered; but this should be avoided, as it occasions loss. A very agreeable perfume.

Bosphorus Bouquet.—Extract acacia, 1 pt.; extract jasmine, ½ pt.; extract rose triple, ½ pt.; extract fleur d'orange, ¼ pt.; extract tuberose, ½ pt.; extract civit, ¼ pt.; otto of almonds, 10 drops.

Buckingham Palace Bouquet.—Extract fleur d'orange, extract cassie, extract jasmine, extract rose, from pomade of each, 1 pt. Extract of orris, extract of ambergris, of each, ½ pt.; otto of neroli, ½ dr.; otto of lavender, ½ dr.; otto of rose, 1 dr.

Bouquet de Caroline.—Add to recipe for Ess. Bouquet 1 pt. extract neroli, costing same sum.

Bridal Bouquet Extract.—

Mix vanilla tincture	2	drm.
Musk tincture	1	drm.
Benzoin tincture	1	drm.
Orris tincture	1	drm.
Cassie essence	4	oz.
Tuberose essence	2	oz.
Jasmine essence	2	oz.
Bergamot, otto	16	min.
Orange flower otto	6	min.

Cost, $2.35 per pint.

Bouquet Fedora.—

Otto rose, Kissanlik	½	drm.
Turkish geranium	¼	oz.
Oil patchouly	¼	drm.
Extract tonka	3	oz.
Extract musk	2	oz.
Orange flower	3	oz.
Extract vanilla	½	oz.
Extract civet	½	oz.
Alcohol	2½	pt.

Floral Bouquet.—

Mix Musk tincture	2	oz.
Orris tincture	6	drm.
Tonka tincture	6	drm.
Vanilla tincture	6	drm.
Ambergris tincture	1	oz.
Rose spirit	4	oz.

Cost, $1.05 per pt.

The Guards' Bouquet.—Espirit de rose, 2 pt.; esprit de neroli, ½ pt.; extract vanilla, ½ pt.; extract orris, ½ pt.; extract musk, ¼ pt.; otto of cloves, ½ drm.

Isle of Wight Bouquet.—Extract of orris, ½ pt., extract of vitivert, ¼ pt.; extract of santal, 1 pt.; extract of rose, ½ pt.

Jockey Club Bouquet (English formula).—Extract orris root, 2 pt.; esprit de rose, triple, 1 pt.; esprit de rose de pommade, 1 pt.; extract de cassie, tuberose de pommade, of each, ½ pt.; extract de ambergris, ½ pt.; otto of bergamot, ½ oz.

Jockey Club Bouquet (French formula).—Esprit de rose, de pommade, 1 pt.; esprit de tuberose, 1 pt.; esprit de cassie, ½ pt.; esprit de jasmine, ¼ pt.; extract civet, 3 oz.

Bouquet de la Reine d'Angleterre.—The following is Piesse's formula, and the others given below are from the same excellent authority, unless otherwise specified:

Extract of rose	56 parts.
Extract of violets	56 parts.
Extract of tuberose	28 parts.
Extract of orange flowers	14 parts.
Essential oil of bergamot	7 parts.

Mix and filter.

Bouquet de la Reine.—

Essence (oil) of bergamot	2½	drm.
Oil of lavender (Mitcham)	1	drm.
Oil of cloves	½	drm.
Aromatic vinegar (glacial)	½	drm.
Essence of musk	½	drm.
Alcohol	3	fl. oz.

Mix, with agitation, as before. Very fine.

Bouquet Ristori.—

Oil rose, Kissanlik	½	oz.
Oil sandal wood	½	oz.
Extract tonka	1	pt.
Alcohol	2	gal.
Water	4	pt.

Bouquet du Roi.—Extract of jasmine, extract of violet, extract of rose from pomade, of each, 1 pt. Extract of vanilla, extract of vitivert, of each, ¼ pt. Extract of musk, extract of ambergris, of each, 1 oz. Otto of bergamot, 1 drm.; otto of cloves, 1 oz.

Leap Year Bouquet.—Extract tuberose, 1 pt.; extract jasmine, 1 pt.; extract rose triple, ½ pt.; extract santal, ½ pt.; extract vitivert, ½ pt.; extract patchouly, ½ pt.; extract verbena, ⅛ pt.

Bouquet de Montpellier.—Extract tuberose, 1 pt.; extract rose pomade, 1 pt.; extract rose triple, 1 pt.; extract musk, ¼ pt.; extract ambergris, ¼ pt.; otto of cloves, 1½ drm.; otto of bergamot, ½ oz.

Bouquet Pompeii.—

Extract of jasmine	1	liter.
Extract of rue	1	liter.
Extract of cassia	0·50	liter.
Essence of bergamot	0·060	grm.
Essence of tonka beans	0·030	grm.
Essence of santal	0·030	grm.
Tincture of musk	0·200	grm.

—*S. Piesse, Chimie des Parfums.*

Princess Bouquet Extract.—

Bergamot, otto	½	drm.
Clove, otto	½	drm.
Lavender, otto	1	drm.
Musk tincture	2	drm.
Vanilla *tincture*	2	drm.
Ambergris tincture	2	drm.
Rose spirit	1 oz. and 2	drm.
Alcohol	8	oz.
Costs	$1.03	per pt.

Mix.

Royal Hunt Bouquet.—Esprit de rose triple, neroli, acacia, fleur d'orange, musk, orris, of each ¼ pt.; esprit de Tonquin, ½ pt.; otto of citron zeste, 2 drm.

Tulip Bouquet.—Though most beautiful to look at, nearly all varieties of the tulip are inodorous, yet the variety called Duke of Thol exhales a delicious odor, but which is not cultivated by the perfumer. Nevertheless an excellent preparation is prepared in the following manner:

Extract of tuberose, from pomade	0·56 liter.
Extract of violets, from pomade	0·56 liter.
Extract of jasmine, from pomade	0·56 liter.
Extract of roses	85 grm.
Essence of almonds	3 drops.

—*S. Piesse, Chimie des Parfums.*

Yacht Club Bouquet.—Extract of santal, 1 pt.; extract neroli, 1 pt.; extract jasmine, extract rose triple, of each, ½ pt.; extract vanilla, ¼ pt.; flowers of benzoin, ¼ oz.

Cassie (*Acacia Farnesiana*).—Cassie is cultivated in southern France and Italy, and produces a very valuable perfume, resembling violets, but stronger.

Essence of Cassie.—

Cassie pomade	16 oz.
Deodorized alcohol	q. s. or 16 oz.

Introduce the pomade and alcohol into a Mason fruit jar of ½ gal. capacity. Digest by means of a water bath until the pomade is barely melted; shake well together, and repeat the shaking frequently until cold. Allow this to stand thirty days, then drain off the essence. If this falls short of 1 pt., repeat with a sufficient quantity of alcohol to make up that measure. The washing can be continued, and a second pint of essence obtained, which, although much weaker, may be found useful in a cheaper grade of perfumes.

Lebanon Cedar Wood.—For the handkerchief, otto of cedar, 1 oz.; rectified spirit, 1 pt., esprit rose triple, ¼ pt.

Citronella (*Andropogon Mardus*).—Oil of citronella is obtained by distillation from citronella grass, a native of Ceylon and India.

Civet (*from Viverra Civetta*).—This substance is secreted by the civet cat. It is found in a large double glandular receptacle, between the anus and pudendum. The cat abounds in portions of Asia. Civet has a most disagreeable odor, but as a fixing substance, for giving permanence to the more fleeting odors, it is very valuable.

Tincture of Civet.—

Civet	1 drm.
Orris root powdered	1 drm.
Deodrized alcohol	16 oz.

Proceed as with the tincture of ambergris.

Civet Tincture.—

Civet	30 grn.
Orris root, powdered	1 drm.
Alcohol	8 oz.

Triturate the civet with the orris root until thoroughly mixed, then add the alcohol and macerate for thirty days, with occasional agitation and filter.

Clove (*Caryophyllus*).—The clove tree is one of the most elegant trees found in the Moluccas and other islands of the Chinese seas. Clove is a leading feature in some of the fine bouquets.

Spirit of Cloves.—

1.	Oil of cloves	4 drm.
	Deodorized alcohol	16 oz.
2.	Mix clove otto	20 min.
	Alcohol	4 oz.

Economical Perfumes.—1. 90% alcohol, 1 pt.; essence bergamot, 1 oz.

2. 90% Alcohol, 1 pt.; otto of santal, 1 oz.

3. 90% Alcohol, 1 pt.; otto French lavender, ½ oz.; otto bergamot, ½ oz.; otto cloves, 1 drm.

4. 90% Alcohol, 1 pt.; otto lemon grass, ¼ oz.; essence lemons, ½ oz.

5. Alcohol, 2 pt.; otto petit grain, ¼ oz.; otto orange peel, ½ oz. Nearly all these perfumes will require to be filtered through blotting paper, with the addition of a little magnesia to make them bright.

Imitation Eglantine or Essence Sweet Brier.—Spirituous extract of French rose pomatum, 1 pt.; spirituous extract cassie, ¼ pt.; spirituous extract fleur d'orange, ¼ pt.; esprit de rose, ¼ pt.; oil of neroli, ½ drm.; oil of lemon grass (verbena oil), ½ drm.

Extract of Elder Flowers.—Elder flower water, 1 qt.; tincture benzoin, 1 oz.

Empress Eugenie's Nosegay.—Extract of musk, vanilla, Tonquin bean and neroli, of each ¼ pt.; extract geranium, rose triple, santal, of each ½ pt.

Essences of Flowers.—The essences of those flowers which are not separately given in this work may be made by one or other of the following general formulæ:

Take of—

Essential oil of the respective flowers	1	oz.
Rectified spirit	1	pt.

dissolve, as directed for essence of almonds.

Frangipanni.—

1.	Oil fine lavender	½ oz.
	Oil geranium leaf	½ oz.
	Oil Turkish geranium	½ oz.
	Otto rose	1 dr.
	Extract musk	6 oz.
	Extract tonka	6 oz.
	Extract sandal wood	1 pt.
	Extract vanilla	2 oz.
	Extract civet	1 oz.
	Alcohol	1 gal.
	Water	8 oz.
	Extract orange flower	5 oz.
2.	Tuberose essence	1 oz.
	Vetivert spirit	½ oz.
	Sandal otto	15 min.
	Rose otto	15 min.
	Orange flower otto	15 min.
	Alcohol	½ oz.
	Musk tincture	2 oz.
	Orris tincture	1 oz.
	Orange flower essence	1 oz.

Cost, $3.00 per pt.

3.	Extract orris	4 oz.
	Extract tuberose	2 oz.
	Extract musk	4 oz.
	Extract vanilla	2 oz.
	Extract jasmin	1 oz.
	Extract styrax	1 oz.
	Otto neroli sugar	1 dr.
	Otto rose virgin	½ dr.
	Otto santal flav	1 dr.
	Otto red cedar wood, true	1 dr.
	Otto pimento	½ dr.
	Otto cassia	20 min.
	Otto bergamot	½ dr.
	Otto ginger	4 drops.
	Otto lavender, English	6 drops.
	Benzoic acid	2 dr.
	Pure spirit sufficient to make	4 pints.
4.	Tincture of musk	5 oz.
	Tincture of civet	4 dr.
	Tincture of orris root	3 oz.
	Essence of orange flowers	3 oz.
	Essence of tuberose	3 oz.
	Spirit of vitivert	1 oz.
	Oil ol santal	60 drops.
	Oil of neroli petale	60 drops.
	Oil of rose	120 drops.
	Oil of rose geranium	60 drops.

Cost, $6.50 per pint. Where there is a demand for something lasting, regardless of price, this will prove satisfactory.

Geranium (Pelargoneum Capitatum).—Geranium oil is obtained in southern France and Turkey, from rose leaf geranium.

Rose Geranium Extract.—

Oil of rose geranium	1 oz.
Deodorized alcohol	15 oz.

Cost, 80c. per pt.

Geranium No. 1.—

Oil geranium leaf	2 oz.
Oil Turkish rose	2 oz.
Oil bergamot	1 oz.
Extract orange flower	5 oz.
Extract civet	1 oz.
Alcohol	1 gal.
Water	8 oz.

Geranium No. 2.—

Oil geranium leaf	1 oz.
Oil Turkish geranium	1 oz.
Oil bergamot	1 oz.
Extract benzoin	2 oz.
Extract vanilla	2 oz.
Alcohol	2 gal.
Water	3 pt.

Guibourt's Royal Essence for the Handkerchief.—This very persistent perfume is made as follows:

Take of—

Ambergris	25 parts.
Musk	12 parts.
Civet (Vivera civetta)	5 parts.
Oil of rose	2 parts.
Oil of cinnamon (Laurus cinnamomum)	3 parts.
Oil of wood of Rhodes (Convolvulus scoparius)	2 parts.
Oil of orange flowers (Citrus aurantium)	2 parts.
Carbonate of potash	6 parts.
Alcohol at 90°	860 parts.

Macerate for fifteen days and filter.

Heliotrope, No. 1.—

Extract orange flower	1 oz.
Extract white rose	1 qt.
Extract vanilla	½ pt.
Extract benzoin	1 oz.
Extract civet	1 oz.
Alcohol	1 pt.
Oil of bitter almonds	3 min.
Water	2 oz.

Note.—If you will get the flower heliotrope, you will notice a slight odor of bitter almonds. Put into the extract only the amount required to imitate that.

Heliotrope, No. 2.—

Oil bergamot	1 oz.
Extract vanilla	½ pt.
Extract civet	½ oz.
Extract benzoin	½ oz.
Alcohol	1 gal.
Extract orris	1 pt.
Oil bitter almonds	5 drp.
Water	3 pt.

3. Tincture of vanilla	8 oz.
Tincture of ambergris	1 oz.
Tincture of civet	1 oz.
Spirit of rose	3 oz.
Essence of rose	3 oz.
Oil of bitter almond	5 drp.

Cost, $2.10 per pint.

Honeysuckle Extract.—

Mix Patchouly extract	3 drm.
Benzoin tincture	½ oz.
Rose essence	½ oz.
Clove spirit	½ oz.
Civet tincture	1 oz.
Orange flower spirit	1 oz.
Jasmin essence	4 oz.
Vanilla tincture	1 oz.

Cost, $1.50 per pint.

Honeysuckle.—

Essence of rose	4 oz.
Essence of violet	4 oz.
Essence of tuberose	4 oz.
Tincture of vanilla	1 oz.
Tincture of tolu	1 oz.
Tincture of musk	1 oz.
Oil of neroli petale	3 drops.
Oil of bitter almond	2 drops.
Deodorized alcohol	1 oz.

Cost, $2.80 per pint.

Iceland Wintergreen.—Esprit de rose, 1 pt.; essence of lavender, ¼ pt.; extract of neroli, ½ pt.; extract of vanilla, ¼ pt.; extract of vitivert, ¼ pt.; extract of cassie, ½ pt.; extract of ambergris, ¼ pt.

Japanese Perfume.—Extract of rose triple, ½ pt.; extract vitivert, ½ pt.; extract patchouly, ½ pt.; extract cedar, ½ pt.; extract santal, ½ pt.; extract verveine, ¼ pt.

Jasmine (Jasminum Odoratissimum).—Jasmine is cultivated in southern France and Italy. Its odor is so peculiar and fine, it cannot itself be imitated, but is used for imitating odors of other flowers.

Essence of Jasmine.—

Jasmine pomade	16 oz.
Deodorized alcohol	q. s. or 16 oz.

Proceed as with cassie.

Jasmine Extract.—

Mix Jasmine essence	4 oz.
Vanilla tincture	½ oz.
Ambergris tincture	2 drm.

Cost, $2.24 per pt.

Jessamine.—

Extract jessamine from pomade.	8 pt.
Oil lemon	½ oz.
Oil bergamot	½ oz.

Jockey Club Extract.—

Mix Tuberose essence	2 oz.
Rose spirit	2 oz.
Rose essence	2 oz.
Ambergris tincture	1½ oz.
Civet tincture	2 drm.
Musk tincture	2 drm.
Bergamot otto	30 min.
Clove otto	10 min.

Cost, $1.84 per pt.

Jockey Club.—

Extract jasmin	5 oz.
Extract orris	20 oz.
Extract musk	7 oz.
Extract vanilla	1½ oz.
Otto rose, virgin	1½ drm.
Otto santal flav	1½ drm.
Otto bergamot	2½ drm.
Otto neroli super	40 min.
Benzoic acid	2 drm.
Pure spirit....sufficient to make	4 pt.

In this, as well as the following extracts, before adding the last portion of the spirit, replace as much of it with water as the perfume will bear without becoming milky, which will vary from 2 to 8 oz. or more. This addition will make the perfume softer.

Jockey Club, No. 1.—

Extract musk	1½ pt.
Extract civet	2 oz.
Extract benzoin	1½ oz.
Extract orange flower	4 oz.
Extract otto rose, Kissanlik	2 drm.
Alcohol	1 gal.
Water	½ pt.

Note.—The water should not be put in until the oils are all cut or dissolved by the alcohol, and after that the extract should have time, say one night, so as to digest fully.

Jockey Club, No. 2.—

Oil bergamot	2 oz.
Oil lavender, fine	½ oz.
Extract civet	2 oz.
Extract benzoin	2 oz.
Extract musk	1 pt.
Alcohol	2 gal.
Water	3 pt.

Jockey Club, No. 3.—

Spirit of rose	4 oz.
Essence of rose	1 oz.
Essence of tuberose	4 oz.
Essence of cassie	2 oz.
Essence of jasmine	1 oz.
Essence of orange flowers	1 oz.
Tincture of civet	2 oz.
Tincture of musk	1 oz.

Cost, $2.50 per pint.

True Extract of Jonquil.—Jonquil pomade, 8 lb.; spirit, 60 overproof, 1 gal. Let it stand one month.

Imitation Extract of Jonquil.—Spirituous extract of jasmine pomade, 1 pt.; spirituous extract tuberose, 1 pt.; spirituous extract fleur d'orange, ½ pt.; extract vanilla, 2 fl. oz.

Kew Garden Nosegay.—Esprit de neroli, petale, 1 pt.; esprit de cassie, esprit de tuberose, from pomade, of each ½ pt.; esprit de jasmine, esprit de geranium, of each ½ pt.; esprit de musk, esprit de ambergris, of each 3 oz.

May Flowers.—Extract of rose de pommade, ½ pt.; extract of jasmine, ½ pt.; extract fleur d'orange, ½ pt.; extract cassie, ½ pt.; extract of vanilla, 1 pt.; otto of almonds, ¼ drm.

Millefleur Lavender, Delcroix's.—Spirits from grapes, 1 pt.; French otto of lavender, 1 oz.; extract of ambergris, 2 oz.

Lavender, Lavendula Vera.—The best oil of lavender comes from Mitcham, in England, where the plant is grown extensively.

Essence of Lavender.—

Oil of lavender, Mitcham	1 oz.
Rectified spirit, strongest	½ pt.

Mix, with agitation; a few drops of the essences of musk and ambergris being added, at will; very fine.

Lavender Water. See **Waters.**

Lavender Extract.—

Oil of lavender, Mitcham	4 drm.
Essence of rose	2 oz.
Deodorized alcohol	14 oz.

Cost, $2.30 per pt. By using the common oil of lavender flowers, the cost will be about $1.20.

Lemon (Citrus Limonum).—The lemon tree is a member of the great Citrus family. Sicily produces a large amount of oil of lemon. The raising and extracting of oils of lemon, orange, and bergamot form one of the chief industries in the vicinity of Palermo.

Essence of Lemon.—

Oil of lemon	4 drm.
Carb. magnesia	4 drm.
Sugar	4 drm.
Deodorized alcohol	8 oz.
Water	8 oz.

Dissolve the oil in two ounces of alcohol; triturate in a mortar with the magnesia and sugar. Gradually add the remainder of the alcohol and water, and filter. This is also used for dispensing.

Lemon Grass (Andropogar Citratus).—Is a species of grass growing in India; on account of its odor resembling verbena, the oil is used for preparing the extract of verbena.

Imitation Essence of White Lilac.—Spirituous extract from tuberose pomade, 1 pt.; spirituous extract of orange flower pomade, ¼ pt.; otto of almonds, 3 drops; extract of civet, ½ oz.

Lily of the Valley, or White Pond Lily.—

1. Essence of tuberose 8 oz.
Essence of jasmine 1 oz.
Essence of orange flowers 1 oz.
Essence of cassie 2 oz.
Essence of rose 2 oz.
Spirit of rose 1 oz.
Tincture of vanilla 1 oz.
Oil bitter almonds 2 drops.

Cost, $2.50 per pint.

2. The celebrated Lily of the Valley perfume is said to be made as follows:

Extract of jasmine	100·0
Extract of ylang ylang	15·0
Cardamom seeds	5·0
Oil of orris flower	10 drops.

The cardamom odor, if predominating, must be neutralized with jasmine.

Marie Stuart, No 1.—

Extract musk	4 oz.
Extract civet	4 oz.
Extract benzoin	4 oz.
Extract orange flower	16 oz.
Extract oil of rose, Kissanlik	60 min.
Oil bergamot	60 min.
Extract tonka	4 oz.
Alcohol	1 gal.
Water	1 pt.

Marie Stuart, No. 2.—To recipe for night blooming cereus:

Extract tonka	4 oz.

Magnolia, No. 1.—

Otto rose	1 drm.
Oil Turkish geranium	1 drm.
Extract tonka	4 oz.
Extract civet	1 oz.
Extract musk	3 oz.
Extract orange flower	6 oz.
Extract vanilla	6 oz.
Alcohol	½ gal.
Water	4 oz.

Magnolia, No. 2.—

Oil Bergamot	2 oz.
Extract vanilla	8 oz.
Extract tonka	2 oz.
Extract civet	1 oz.
Extract benzoin	1 oz.
Alcohol	2 gal.
Water	3 pt.

Mignonette.—

Extract orris	12 oz.
Extract tuberose	4 oz.
Extract vanilla	4 oz.
Extract musk	2 oz.
Otto rose, virgin	1 drm.
Otto neroli super	1¼ drm.
Otto pimento	12 min.
Benzoic acid	1 drm.
Pure spirit	sufficient to make 4 pt.

Millefleur.—1. Add to Bouquet de Caroline.—

Extract orange flower	1 pt.
Extract civet	1 oz.
Extract benzoin	1 oz.

2. Otto rose, virgin 1 drm.
Otto red cedar wood (true) 1 drm.
Otto orange (new) 1 drm.
Otto pimento 20 min.
Extract orris 6 oz.
Extract jasmine 2 oz.
Extract styrax 1 oz.
Extract tonka 4 oz.
Pure spirit sufficient to make 4 pt.

Millefleurs (Thousand Flowers).—

Spirit of rose	3 oz.
Essence of rose	1 oz.
Essence of jasmine	4 oz.
Essence of orange flowers	2 oz.
Essence of cassie	2 oz.
Tincture of orris	2 oz.
Tincture of tonka	4 drm.
Tincture of ambergris	4 drm.
Tincture of musk	4 drm.
Oil bitter almonds	3 drops.
Oil of neroli petale	3 drops.
Oil of cloves	3 drops.
Oil of bergamot	120 drops.

Cost, $2.55 per pint.

Musk (from Moschus, Moschatus).—Musk is obtained from the musk deer, a small animal inhabiting the mountainous regions of Central Asia. Grain musk is the best form in which to purchase the article. Musk is used extensively in perfumes, both as a simple extract and for giving permanence to more fleeting odors.

Tincture of Musk.—

Grain musk	2 drm.
Hot water	1 oz.
Deodorized alcohol	15 oz.

Rub the musk to a fine paste with the hot water. Digest in a covered mortar for two hours; add the alcohol, and transfer to a tightly corked bottle. Digest for thirty days and filter.

Musk.—

1. Tincture of musk	11 oz.
Spirit of rose	4 oz.
Tincture of civet	1 oz.

Cost, $5.90 per pint. This is rather a high priced article, but the tincture of musk can be reduced one-half with alcohol and still yield a satisfactory result. The cost will then be $3.25.

2. Extract musk	1 pt.
Extract orris	6 oz.
Extract vanilla	2 oz.
Extract styrax	2 drm.
Otto santal flav	1 drm.
Otto bergamot	2 drm.
Otto neroli super	10 min.
Otto patchouly	12 min.
Otto lavender (English)	15 min.
Otto cinnamon (true)	6 min.
Pure spirit ...sufficient to make	4 pt.
3. Tonquin grain musk	1 drm.
Hot water	4 drm.
Alcohol	1 pt.

Digest the musk in the hot water for three or four hours, then add the alcohol and macerate for thirty days, with occasional agitation, and filter.

Musk Extract.—

1. Mix musk tincture	2 oz.
Civet tincture	2 oz.
Rose otto	10 min.
Alcohol	1 oz.

Cost, $2.26 per pt.

This extract of musk is a more pleasant and of a more natural musk odor than any that has been produced from the grain musk alone.

2. Take of pure grain musk, of the first quality, 2 drm. Mix ½ oz. of liquor potassæ with 4 oz. of proof spirit, and triturate the musk with this mixture until it is thoroughly softened and reduced to a creamy state; add enough proof spirit to make up about 1 pt.; stir well, then allow the coarser particles to subside, and pour off the supernatant fluid. Rub the coarser portions again with a fresh portion of spirit, proceeding as before, and repeat the process until the musk is entirely reduced, and the quantity of extract measures 3 pt. Allow this to stand for a fortnight, with occasional shaking, when it will be ready for use.

3. Grain musk	¼ oz.
Rectified spirit (56 o. p.)	1 qt.
Essence of ambergris (finest)	2 fl. oz.

Digest, etc., as before. Excellent, but greatly inferior to the others.

Imitation Essence of Myrtle.—Extract of vanilla, ½ pt.; extract of roses, 1 pt.; extract fleur d'orange, ½ pt.; extract tuberose, ½ pt.; extract jasmine, 2 oz.

Extract of Narcissus.—Extract of tuberose, 3 pt.; extract of jonquil, 2 pt.; extract of styrax, ¼ pt.; extract of tolu, ¼ pt.

Neroli Spirit.—

Oil neroli petale	4 drm.
Deodorized alcohol	16 oz.

New Mown Hay.—

1. Tonka tincture	4 oz.
Musk tincture	1 oz.
Benzoin tincture	1 oz.
Rose spirit	1 oz.
Rose geranium oil	40 min.
Bergamot oil	40 min.
Alcohol (rectified)	1 oz.
2. Tincture of tonka	6 oz.
Spirit of rose	3 oz.
Essence of rose	3 oz.
Essence of jasmine	3 oz.
Oil of neroli petal	10 drops
Oil of rose geranium	60 drops.
Deodorized alcohol	4 oz.

Cost, $1.65 per pint.

3. Extract tonka	25 oz.
Extract musk	6 oz.
Extract orris	8 oz.
Extract vanilla	1 oz.
Extract styrax	1 drm.
Otto bergamot	1 drm.
Otto neroli super	15 min.
Otto rose, virgin	10 min.
Otto cloves	6 min.
Otto lavender (English)	10 min
Otto patchouly	10 min.
Otto santal flav	1 drm.
Benzoic acid	1½ drm.
Pure spirit ...sufficient to make	4 pt.
4. Oil geranium from leaf	2 drm.
Turkish geranium	2 drm.
Extract white rose	1 qt.
Extract orange flower	1 pt.
Tonka extract	8 oz.
Alcohol	2 qt.
Extract vanilla	4 oz.
Water	4 oz.
Extract musk	4 oz.

For new names for bouquet odors, take names of persons or places as desired.

5. Mix moss rose extract	1 oz.
Benzoin tincture	1 oz.
Tonka tincture	4 oz.
Musk tincture	1 oz.
Rose geranium otto	40 min.
Bergamot otto	40 min.
Alcohol	1 oz.

Cost, $1.50 per pt.

Night Blooming Cereus.—

1. Spirit of rose	4 oz.
Essence of jasmine	4 oz.
Tincture of tonka	2 oz.
Tincture of civet	2 oz.
Tincture of benzoin	4 oz.
2. Extract vanilla	8 oz.
Extract civet	2 oz.
Extract benzoin	2 oz.
Oil bergamot	2 oz.
Alcohol	2 gal.
Water	3 pt.

Orange (Citrus Aurantium, Citrus Bigarade).—From the orange tree is obtained five distinct and valuable perfumes. 1. The true flower odor, obtained by digesting the flowers with

lard. 2. Oil neroli petale, or oil neroli bigarade, by distilling the flowers of the sweet and bitter orange respectively. 3. Oil of neroli petit grain, by distilling the leaves and unripe fruit. 4. Oil of orange, Portugal, obtained by rolling the fruit in a metal cup covered with spikes, known as an ecuelle, which wounds the fruit and causes the oil to flow from the oil glands. 5. Commercial oil of orange, obtained by expressing or distilling the orange peel. The orange tree is cultivated extensively in southern France, Italy and Sicily.

Essence of Orange Flowers.—

1. Orange flower pomade	16	oz.
Deodorized alcohol	q. s. or 16	oz.

Proceed as with cassie.

Essence of Neroli, Essence of Orange Blossoms.—

1. Neroli (pure)	½	oz.
Rectified spirit	1	pt.

Dissolve. An ounce of the essence of jasmine, jonquille or violets is often added. A delicate and delicious perfume. A spurious or compound article is often prepared as follows:

2. Oil of orange peel (recent)	1	dr.
Neroli	½	dr.
Ambergris	5 or 6	gr.
Orris root (bruised)	¼	oz.
Rectified spirit	½	pt.

Digest fourteen days. Strongly and agreeably fragrant, but less chaste than the preceding, and, to a cultivated nose, very different.

Orange Flower Extract.—

Essence of orange flowers	12 oz.
Essence of cassie	2 oz.
Tincture of musk	2 oz.

Cost, $3.20 per pint.

Orange Flower Spirit.—

Orange flower otto	40 min.
Alcohol	8 oz.

Orris (Iris Florentina).—Is largely cultivated near Florence, Italy.

Orris Tincture.—

Orris root, powdered	2 oz.
Alcohol	4 oz.

Macerate the orris root for seven days and filter, then percolate the orris root with alcohol sufficient to make the measure up to 4 fl. oz.

Extract of Orris.—Seven pounds of finely ground orris root of good quality is treated by percolation with pure alcohol until 1 gal. of extract is obtained.

Patchouly (Pogostemon Patchouli, Lindley.—Patchouly is a native of Selhet, a district of Bengal. It is also found in Java, Ceylon and portions of China. The oil is distilled from the fresh herb. It has a very peculiar, musty, mossy odor, but when properly blended forms a very fashionable perfume.

Patchouly.—

1. Oil of patchouly	75	drops.
Oil of rose	15	drops.
Deodorized alcohol	16	oz.

Cost, 75 cents per pt.

2. Otto patchouly	2	dr.
Otto santal flav	40	min.
Rose, virgin	40	min.
Ext. musk	8	oz.
Ext. orris	8	oz.
Ext. vanilla	4	oz.
Ext. styrax	2	dr.
Pure spirit...sufficient to make	4	pt.

3. Mix Patchouly otto	2	drm.
Rose otto	20	min.
Alcohol	15	oz.

Cost, $0.96 per pt.

Quality No. 1.—

Oil patchouly	3	oz.
Extract benzoin	2	oz.
Extract civet	2	oz.
Extract orange flower	4	oz.
Alcohol	1	gal.
Water	2	oz.

Quality No. 2.—

Oil patchouly	1	oz.
Extract benzoin	1	oz.
Extract civet	1	oz.
Alcohol	1	gal.
Water	3	pt.

Sweet Pea.—

Essence of tuberose	5	oz.
Essence of orange flower	5	oz.
Essence of rose	5	oz.
Tincture of tonka	1	oz.

Cost, $2.50 per pt.

Essence of Peach Blossoms, Extract of Peach Blossoms.—This name is fancifully given to the following preparation:

Oil of lemon (recent)	1	fl. drm.
Balsam of Peru	15	grn.
Essential oil of almonds	8	grn.
Spirit of orange flowers	2½	fl. oz.
Spirit of jasmine	5	fl. drm.
Rectified spirit	7	fl. oz.

Agitate them together for a few days, and after another week pour off the clear portion. A refreshing and powerful perfume, much esteemed for personal use. A second quality is made with spirit only 35% over proof.

Piesse's Posy.—Extract of rose (from pomade), 1 pt.; esprit of rose triple, ½ pt.; extract of jasmine, extract of violet, from pomade, of each ½ pt.; extract of verbena, extract of cassie, of each 2½ oz.; otto of lemons, otto of bergamot, of each ¼ oz.; extract of musk, extract of ambergris, of each 1 oz.

Pimento.—The allspice tree is a native of the West Indies, Mexico, and South America. The oil is obtained by distilling the berries.

Clove Pink.—

1. Extract jasmine	12	oz.
Extract orris	12	oz.
Extract musk	8	oz.
Otto rose, virgin	1	drm.
Otto cloves	2	drm.
Otto neroli super	1	drm.
Otto pimento	10	min.
Otto patchouly	20	min.
Otto santal flav	2	drm.
Benzoic acid	1	drm.
Pure spirit...sufficient to make	4	pt.

2. Essence of rose	6	oz.
Essence of cassie	4	oz.
Spirit orange flower	4	oz.
Tincture of vanilla	2	oz.
Oil of cloves	10	drops.

Cost, $2.40 per pt.

3. Mix clove spirit	2	drm.
Vanilla tincture	½	oz.
Violet essence	½	oz.
Orange flower spirit	1	oz.
Rose spirit	2	oz.

Cost, $1.35 per pt.

Sweet Pink.—

Oil ylang ylang	1	drm.
Oil bergamot	2	drm.
Extract benzoin	2	drm.
Civet	2	drm.
Extract rose from pomade	8	oz.
Alcohol	1½	qt.

The cost of these formulas varies from $1.50 to 75 cents per pint, at present price of alcohol and other material.

Rondoletia.—

1. Tincture of musk	4	drm.
Tincture of ambergris	4	drm.
Tincture of vanilla	4	drm.
Oil of bergamot	1	drm.
Oil of lavender (Mitcham)	2	drm.
Oil of cloves	1	drm.
Oil of rose	30	dr'p.
Deodorized alcohol	14	oz.

Cost, $1 per pint. With common oil of lavender flowers it will cost $1.60.

2. Otto lavender (English)..... 1 oz.
Otto cloves..... ½ oz.
Otto bergamot..... ½ oz.
Otto rose geranium (Turkey).. 2 drm.
Otto cinnamon (true).....20 min.
Otto rose, virgin.....10 min.
Otto santal flavor..... 1 drm.
Extract musk..... 2 oz.
Extract orris..... 4 oz,
Extract vanilla..... 2 oz.
Benzoic acid..... 1 drm.
Pure spirit..sufficient to make 4 pints.

3. Mix lavender otto (English)... 1 drm.
Clove otto.....15 min.
Bergamot otto.....30 min.
Musk tincture..... 2 drm.
Vanilla tincture..... 2 drm.
Ambergris tincture ..... 2 drm.
Rose spirit..... 1½ oz.
Alcohol..... 8 oz.
Cost, $1.10 per pint.

Rose (Rosa Centifolia).— This is truly the queen of flowers; and although roses are found growing wild in nearly every part of the world, it is only in France, Turkey, and India that they are cultivated for their perfume. The Turkish oil is the one commonly found in the market. Oil of rose should congeal at 80° F. When slowly cooled to 50° F., the oil becomes a transparent solid, interspersed with numerous slender, shining, iridescent scale like crystals (U. S. P.). The oil is obtained by distilling the flowers with water.

Essence of Rose.—

Rose pomade.....16 oz.
Deodorized alcohol.....q. s. or 16 oz.

Proceed as with cassie essence.

Spirit of Rose.—

1. Oil of rose..... 2 drm.
Oil of rose geranium..... 1 drm.
Deodorized alcohol..... 16 oz.

The oil of rose geranium is added to give permanence to the spirit.

2. Rose otto.....50 min.
Rose geranium otto.....40 min.
Alcohol..... 8 oz.

Esprit de Rose.—The compound perfume sold under this name is commonly made as follows:

1. *Esprit de Rose* (simple, finest)... 1 pt.
Essence of ambergris..... ½ fl. drm.
Oil of rose geranium..... ½ fl. drm.

Mix. Delicately fragrant.

2. Otto of roses (finest)..... 1½ drm.
Neroli..... ½ drm.
Rectified spirit (56 o. p.; warm).. 5 pt.

agitate them together, add of

Chloride of calcium (dry; powdered)..... ¾ lb.

and again well agitate. Next throw the whole into a still, and draw over rapidly by steam heat, ½ gal. Lastly, add to the distillate 1 fl. drm. of essence royale. Very fine. Both are delicate and favorite perfumes.

Essence of Roses (Red).—Concentrated tincture of roses.—

Red rose petale or leaves (dried). 6 oz.
Proof spirit..... 1 qt.

Digest for fourteen days, press, strain, add of

Acetic acid (sp. gr. 1·044)..... 2 fl. drm.

and the next day filter. Used chiefly to color and flavor cosmetics that do not contain alkalies or earths, particularly liquid ones made with spirit.

Essence of Roses.—

1. Otto of roses (pure).... ... 1¼ drm. (troy).
Alcohol (0·806).... ... . 1 pt.

Mix, place the bottle in a vessel of warm water until its contents acquire the temperature of about 85° F., then cork it close, and agitate it smartly until the whole is quite cold. Very fine.

2. Otto of roses ..... 1 drm.
Rectified spirit (66 o. p.)..... 1 pt.

as before. Excellent.

Moss Rose.—

1. Extract rose from pomade.... 4 pt.
Turkish rose..... ½ oz.
Otto rose, Kissanlik..... ½ drm.
Extract musk..... 1 oz.
Extract civet..... ½ oz.
Extract benzoin..... ½ oz.
Alcohol..... ½ gal.
Water..... 4 oz.

2. Mix rose spirit..... 3 oz.
Orange flower essence..... 1 oz.
Ambergis tincture.. ..... ⅛ oz.
Musk tincture..... 2 drm.

Cost, $1.75 per pint.

3. Spirit of rose ..... 9 oz.
Essence of orange flowers..... 3 oz.
Essence of rose ..... 2 oz.
Tincture of civet..... 1 oz.
Tincture of musk..... 1 oz.

Cost, $2.85 per pint.

4. Otto rose, virgin... ..... 2 drm.
Otto santal..... 2 drm.
Extract of musk.....12 oz.
Extract of vanilla..... 4 oz.
Extract of orris..... 2 oz.
Extract of jasmine ..... 4 oz.
Benzoic acid..... 1 drm.
Pure spirit, sufficient to make 4 pints.

Tea Rose.—

Essence of rose... ..... 4 oz.
Spirit of rose..... 8 oz.
Spirit of santal..... 2 oz.
Essence of orange flowers..... 1 oz.
Tincture of orris.... .. .. 1 oz.
Oil of rose geranium.....20 drops.

Cost, $2.20 per pint.

Essence of Tea Rose.—Esprit de rose pomade, 1 pt.; esprit de rose triple, 1 pt.; extract of rose geranium, 1 pt.; extract santal wood, ½ pt.; extract neroli, ¼ pt.; extract of orris, ¼ pt.

White Rose.—

1. Oil Turkish geranium..... 2 oz.
Oil bergamot ..... 2 oz.
Extract benzoin..... 2 oz.
Extract vanilla.... .... 2 oz.
Alcohol..... 2 gal.
Water..... 3 pt.

2. Esprit de rose from pomatum, 1 qt.; esprit de rose triple, 1 qt.; esprit de violette 1 qt.; extract of jasmine, 1 pt.; extract of patchouly, ½ pt.

3. Spirit of rose..... 8 oz.
Essence of rose ..... 3 oz.
Essence of jasmine ... . 4 oz.
Extract of patchouly ..... 1 oz.

Cost, $2.50 per pt.

4. Otto rose, Kissanlik..... 2 drm.
Extract orange flower..... 2 oz.
Extract civet..... 1 oz.
Extract benzoin .. .. 1 oz.
Extract vanilla..... ½ oz.
Turkish rose.... ..... 1 drm.
Alcohol ..... 2½ qt.
Water.... ..... 4 oz.

5. Oil of rose..... 2 drm.
Oil of geranium.... . .....30 drops.
Essence of rose..... 4 oz.
Deodorized alcohol.....16 oz.
Essence of jasmine..... 2 oz.
Tincture of musk..... 1 oz.
Tincture of ambergris..... .. 1 oz.

Cost, $3 per pt.

Extract of white rose is a general favorite, and cannot be recommended too highly.

6. Mix rose spirit..... 4 oz.
Violet essence..... 2 oz.
Jasmine essence..... 2 oz.
Patchouly extract..... ½ oz.
Cost, $1.76 per pt.

7. Otto rose, virgin..... 2 drm.
Otto red cedar wood (true)..... 6 min.
Otto patchouly..... 4 min.
Otto orange (fresh)..... ½ drm.
Extract tuberose..... 2 oz.
Extract orris..... 2 oz.
Extract jasmine..... 2 oz.
Extract musk..... 2 oz.
Benzoic acid..... 1 drm.

Pure sairit (to which 4 oz. rose water has been added), sufficient to make 4 pt.

Rosemary (Rosemarinus Officinalis).—The rosemary plant is a native of the borders of the Mediterranean Sea. It is also cultivated in this country. The oil is one of the leading ingredients in cologne.

Rose Sandal.—
Oil sandal..... 2 oz.
Alcohol..... ½ gal.
White rose extract..... ½ gal.

Sandalwood Extract.—
Sandalwood otto..... 3 drms.
Rose otto..... 20 min.
Alcohol..... 8 oz.
Mix. Cost, $1.25 per pt.

Santal (Santalum Album).—The oil is distilled from the wood, which is a native of Australia and the South Sea Islands.

Spirit of Santal.—
Oil of santal wood..... 2 drm.
Deodorized alcohol..... 16 oz.

Tonka (Dipterix Odorata).—The tonka bean is the fruit of a large South American tree. When fresh they are very fragrant, having a strong odor of new mown hay. They are exported from Para and Angostura. Tonka beans are used for scenting snuff, and by unscrupulous dealers for adulterating vanilla. And in perfumery in the form of tincture they enter into many of the leading bouquets.

Tincture of Tonka.—
Tonka beans..... 6 oz.
Deodorized alcohol, a sufficient quantity.

Reduce the beans to a coarse powder; macerate in a corked bottle with 16 oz. of alcohol for thirty days. Then filter, and add enough alcohol through the filter to make the product measure 16 oz.

Spring Flowers.—
1. Extract orris..... 4 oz.
Extract jasmine..... 4 oz.
Extract musk..... 4 oz.
Otto bergamot..... 2 drm.
Otto neroli super..... ½ drm.
Otto verbena (true)..... 10 min.
Otto red cedar wood (true)..... 1 drm.
Benzoic acid..... 1 drm.
Pure spirit....sufficient to make 4 pints.

2. Essence of rose..... 7 oz.
Essence of violet..... 6 oz.
Oil of bergamot..... 1 drm.
Spirit of rose..... 1 oz.
Tincture of ambergris..... 1 oz.
Essence of cassie..... 1 oz.
Cost, $2.95 per pint.

3. Extract of rose, extract of violet from pomade, of each 1 pt.; extract rose triple, 2½ oz.; extract cassie, 2½ oz.; otto bergamot, 2 drm.; extract ambergris, 1 oz. One of the best perfumes.

4. Rose essence..... 2 oz.
Tuberose essence..... 2 oz.
Rose spirit..... 2 oz.
Musk tincture..... ½ oz.
Ambergris tincture..... 1½ oz.
Clove otto..... 10 min.
Bergamot otto..... ½ drm.
Mix. Cost, $2.60 per pint.

Stephanotis.—
1. Extract of cassia..... 113 grm.
Extract of tuberose..... 113 grm.
Extract of jasmine..... 56 grm.
Extract of musk..... 226 grm.
Extract of iris..... 226 grm.
Extract of tonka..... 85 grm.
Essence of roses..... 1 grm.
Essence of neroli..... 1 grm.
Benzoic acid..... 1 grm.
Alcohol..... 2 liters.
S. Piesse, Chimie des Parfums.

2. Extract of cassia..... 4 oz.
Extract of tuberose..... 4 oz.
Extract of jasmine..... 2 oz.
Extract of musk..... 8 oz.
Extract of orris..... 8 oz.
Extract of tonka..... 3 oz.
Otto rose, virgin..... 1 drm.
Otto neroli super..... ½ drm.
Benzoic acid..... 1 drm.
Pure spirit.....sufficient to make 4 pints.

Stolen Kisses.—Extract jonquil, extract orris, of each, 1 qt.; extract tonquin, extract rose triple, extract acacia, of each, 1 pt.; extract civet, extract ambergris, of each, ¼ pt.; otto of citronella, 1 drm.; otto of verbena, ½ drm.

Extract Tonka.—Take 1 lb. tonka beans; reduce to a coarse powder and percolate with alcohol to make 1 gal.

Tulip Nosegay.—Extract tuberose, extract violet, extract jasmine, from pomade of each, 1 pt.; extract rose, ½ pt.; extract orris, 3 oz.; otto of almonds, 3 drops.

Extract Styrax.—Eight drm. styrax balsam dissolved in 1 pt. of alcohol.

Suave.—Extract tuberose, extract jasmine, extract cassie and extract rose, from pomade of each, 1 pt.; extract vanilla, 5 oz.; extract musk, extract ambergris, of each, 2 oz.; otto of bergamot, ¼ oz.; otto of cloves, 1 drm.

Extract of Tonquin Bean.—Tonquin beans, 1 lb.; alcohol, 1 gal. Digest for a month at summer heat.

Tuberose (Paleanthes Tuberosa).—The tuberose is a native of the East Indies. It is cultivated for its perfume in southern France. Its odor is very fine, and is a general favorite.

Essence of Tuberose.—
1. Tuberose pomade..... 16 oz.
Deodorized alcohol..... q. s. or 16 oz.
Proceed as with cassie.

2. Extract tuberose..... 24 oz.
Extract musk..... 4 oz.
Extract jasmine..... 1 oz.
Otto rose, virgin..... 1 drm.
Otto neroli super..... 10 min.
Benzoic acid..... 2 drm.
Pure spirit....sufficient to make 4 pints.

3. Tuberose essence..... 4 oz.
Orris tincture..... ½ oz.
Ambergris tincture..... ½ oz.
Cost, $2.24 per pt.

4. Essence of tuberose..... 15 oz.
Tincture of ambergris..... 1 oz.
Cost, $2.85 per pt.

5. Extract tuberose from pomade.. 8 pt.
True cinnamon..... 8 min.
Oil bergamot..... ½ oz.

Essence de Tuberose.—The extrait triple of the flowers, or a still stronger *extrait*, prepared with rectified *spirit*, or a spirit of much greater strength than that *usually employed for extraits.* It is nearly colorless, but when required white, or of still greater strength, the *extrait triple* is submitted to distillation by the heat of a water bath; the process being conducted as rapidly as possible, and the first half, or two-thirds, that comes over, being separately collected as the essence. In general, however, unless the process be very skilfully conducted, the odor of the distilled essence, though stronger, is scarcely so chaste and deli-

cate as that of the *extrait* from which it has been prepared.

In a similar way to *essence de tuberose*, the finer qualities of Essences of honeysuckle, jasmine or jessamine, jonquille, May blossom, May lily, myrtle blossoms, narcissus, orange-flowers, roses, violets, wallflowers, and of other flowers of extremely delicate perfume, are usually obtained by the Continental manufacturing perfumers; as also of essence of cassia, vanilla, etc., etc., except that the second is not distilled.

Upper Ten.—

Tincture of vanilla	4	oz.
Tincture of ambergris	3	oz.
Tincture of orris	3	oz.
Spirit of rose	3	oz.
Essence of orange flowers	3	oz.
Oil of bergamot	90	drops.
Oil of lemon	15	drops.

Cost, $2.75 per pt.

Vanilla (Vanilla Planifolia).—The best vanilla beans come from Mexico. Tincture of vanilla is used as a fixing ingredient in some perfumes.

Tincture of Vanilla.—

Vanilla beans	1	oz.
White sugar	1	oz.
Deodorized alcohol	16	oz.

Cut the beans into small pieces. Beat with the sugar in a mortar until they are reduced to a coarse powder. Macerate with the alcohol for thirty days, and filter.

Essence de Vanille Double.—

Vanilla (finest)	12	oz.
Cloves	30	grn.
Ambergris	7	grn.
Grain musk	7	grn.
Esprit d'ambrette	1	pt.
Rectified spirit	1	pt.

Vanilla Tincture.—

Vanilla beans	6	troy drm.
Alcohol	1	pt.

Beat the vanilla to coarse powder, macerate with gentle heat for four hours and filter; while macerating keep a wet towel over mouth of the bottle, using a water bath.

Verbena.—

Oil of lemon grass	50	drops.
Oil of lemon	320	drops.
Oil of neroli petale	20	drops.
Oil of orange	160	drops.
Essence of orange flowers	3	oz.
Essence of tuberose	3	oz.
Spirit of rose	3	oz.
Deodorized alcohol	6	oz.

Cost, $1.90 per pint.

2. Oil of lemon grass	3	drm.
Oil of lemon	4	drm.
Oil of orange	30	drops.
Deodorized alcohol	15	oz.

Cost, 60 cents per pint.

3. Oil lemon grass	3	oz.
Oil bergamot	2	oz.
Extract civet	1	oz.
Extract benzoin	2	oz.
Alcohol	2	gal.
Water	3	pt.
4. Mix verbena otto (true)	1	drm.
Lemon otto	1	drm.
Alcohol	8	oz.

Cost, $1 per pint.

5. Alcohol, 1 pt.; otto of lemon grass, 3 drm.; otto of lemon peel, 2 oz.; otto of orange peel, ½ oz.

Extract de Verveine.—Alcohol, 1 pt.; otto of orange peel, 1 oz.; otto of lemon peel, 2 oz.; otto of citron zeste, 1 dr.; otto of lemon grass, 2½ drm.; extract de fleur d'orange, 7 oz.; extract de tuberose, 7 oz.; esprit de rose, ½ pt. This mixture is exceedingly refreshing and is one of the most elegant perfumes made. Being white, it does not stain the handkerchief.

Victoria.—

Otto rose, virgin	2	drm.
Otto neroli super	2	drm.
Otto bergamot	4	drm.
Otto coriander	16	min.
Otto pimento	24	min.
Otto lavender, English	16	min.
Extract jasmine	2	oz.
Extract orris	16	oz.
Extract musk	2	oz.
Benzoic acid	2	oz.
Pure spirit	sufficient to make	4 pints.

Violets, Viola Odorata.—A very delicate odor, but very fleeting; by the addition of some of the stronger perfumes a very fine and popular perfume is obtained. Violets are cultivated in southern France.

Essence of Violets.—

1. Violet pomade	16	oz.
Alcohol deodorized	q. s. or 16	oz.

Proceed as with cassie essence.

2. Extract violet from pomade	4	pt.
Extract orris	4	pt.
Extract orange flower	2	oz.
Extract cassie	2	oz.
Extract ylang ylang	1	drm.
Otto rose, Kissanlik	½	drm.
Civet	1	oz.
Bergamot	1	drm.
Water	4	oz.
3. No. 1 ylang ylang	1	pt.
Extract cassie from pomade	8	oz.
Extract civet	2	oz.
Extract vanilla	4	oz.
Extract orris	1	pt.
Alcohol	2	gal.
Water	3	pt.
4. Essence of violets	11	oz.
Essence of cassie	2	oz.
Tincture of musk	1	oz.
Tincture of orris	2	oz.

Cost, $3 per pint.

5. Essence of cassie	6	oz.
Essence of rose	3	oz.
Essence of tuberose	3	oz.
Tincture of orris	3	oz.
Spirit of bitter almonds	1	oz.

Cost, $2.05 per pint.

Violet Extract.—

1. Violet essence	4	oz.
Cassie essence	1	oz.
Rose essence	3	drm.
Orris Tincture	1	oz.
Ambergris Tincture	2	drm.
Civet Tincture	2	drm.
Almond spirit	20	min.

Cost, $2.90 per pt.

2. Extract orris	2	pt.
Extract tuberose	4	oz.
Extract vanilla	3	oz.
Extract musk	3	oz.
Extract tonka	2	oz.
Otto rose, virgin	1	drm.
Otto neroli super	40	min.
Otto pimento	12	min.
Otto bergamot	1	drm.
Benzoic acid	1	drm.
Pure spirit	sufficient to make	4 pints.

Wood Violet.—

1. Extact of violets, No. 2	16	oz.
Oil of bitter almonds	15	drops.

Cost $2.10 per pint.

2. Extract of orris	12	oz.
Extract of tuberose	2	oz.
Extract of jasmin	1	oz.
Extract of musk	4	oz.

Vetivert Spirit.—

Mix Vetivert otto	30	min.
Alcohol	4	oz.

Vitivert or Kus Kus (Andropogon Muricatus).—Is the rhizome of an Indian grass.

Spirits of Vitivert.—

Oil of vitivert	30 drops.
Deodorized alcohol	4 oz.

Essence of Volkameria.—Esprit de violette, 1 pt.; esprit de tuberose, 1 pt.; esprit de jasmine, ¼ pt.; esprit de rose, ½ pt.; essence of musk, 2 oz.

Rifle Volunteers' Garland.—Alcohol, 1 pt.; otto of neroli, otto of rose, otto of lavender, otto of bergamot, of each, ¼ oz.; otto of cloves, 8 drops; extract of orris, 1 pt.; extract of jasmine, extract of cassie, of each, ¼ pt.; extract of musk, extract of ambergris, of each, 2½ oz.

Essence of Wallflower.—Imitation.—Extract de fleur d'orange, 1 pt.; extract vanilla, ¼ pt.; esprit de rose, 1 pt.; extract of orris, ½ pt.; extract of cassie, ½ pt.; essential oil of almonds, 5 drops. It should be made up for two or three weeks before using.

West End.—

1. Extract orris	12	oz.
Extract jasmine	4	oz.
Extract musk	8	oz.
Extract cassia	4	oz.
Extract styrax	1	oz.
Otto bergamot	3	drm.
Otto verbena (true)	15	min.
Otto neroli super	½	drm.
Otto rose, virgin	1	drm.
Otto red cedar wood (true)	1	drm.
Benzoic acid	1	drm.
Pure spirit...sufficient to make	4	pints.
2. Mix Rose spirit	3	oz.
Benzoin tincture	1	oz.
Musk tincture	1	oz.
Verbena extract	½	oz.
Civet tincture	½	oz.
Sandalwood otto	10	min.

Cost, $1.65 per pint.

3. Rose spirit	6	oz.
Verbena extract	1	oz.
Benzoin tincture	2	oz.
Civet tincture	1	oz.
Musk tincture	2	oz.
Sandal oil	20	m.

Ylang or Ihlang (Cananga Odorata).—This plant is found in the Philippines and the islands of the Indian Archipelago. The oil is obtained by distilling the flowers. The perfume is very charming and lasting.

Spirit of Ylang.—

Ylang oil	3	drm.
Deodorized alcohol	16	oz.

In the following formulas, if the perfumes are too expensive, the ambergris can be omitted and civet substituted, except in extract of ambergris. The musk can also be reduced in strength one half, and still yield satisfactory results. In all cases secure the best goods, regardless of price. In perfumes, as well as in medicines, quality is of the first importance. When the perfumes are mixed they should be frequently agitated, and allowed to stand two or three weeks before filtering.

Age improves all perfumes, if kept in a moderate atmosphere and in a dark place.

Ylang Ylang.

1. Extract tonka	3	oz.
Extract musk	4	oz.
Extract tuberose	4	oz.
Extract cassia	4	oz.
Extract orris	8	oz.
Otto orange (new)	2	drm.
Otto neroli super	½	drm.
Pure spirit...sufficient to make	4	pt.
Spirit of ylang	8	oz.
Spirit of rose	4	oz.
Essence of jasmine	2	oz.
Tincture of civet	2	oz.

Cost, $2.70 per pint. This is my favorite; it combines fragrance and lasting qualities at a moderate price.

3. Oil ylang ylang	2	drm.
Extract orange flower	2	oz.
Extract civet	1	oz.
Extract benzoin	1	oz.
Extract vanilla	½	oz.
Oil of Turkish rose	1	drm.
Alcohol	2½	qt.
Water	4	oz.
4. Mix Ylang ylang otto	80	min.
Alcohol	8	oz.
5. Mix Ylang Ylang spirit	8	oz.
Jasmine essence	8	oz.

Cost, $3.44 per pt.

Perry.—A fermented liquid, prepared from pears in the same way as cider is from apples. The reduced pulp must not be allowed to remain long without being pressed. In the cask, perry does not bear changes of temperature so well as cider. It is therefore advisable, if at the end of the succeeding summer it be in sound condition, to bottle it, when it will keep perfectly well. The red, rough tasted sorts of pears are principally used for making perry. They should be quite ripe, without, however, approaching to mellowness or decay. The best perry contains about 9% of absolute alcohol; ordinary perry from 5% to 7%.

Perry is a very pleasant tasted and wholesome liquid. When bottled champagne fashion, it is said to frequently pass for champagne without the fraud being suspected.

Perspiration.—When perspiration is excessive it may be regulated by using as a wash, once a day, not oftener, for about two minutes, liquor atropiæ, 2 drm.; water, 1 pt. The face and other parts may also be washed as often as desired with alum, 1 oz.; glycerine, 1 oz.; water, 10 oz.

For Excessive Perspiration of Hands or Feet.—A German pharmaceutical journal recommends the following:

Carbolic acid	1	part.
Burnt alum	4	parts.
Starch	200	parts.
French chalk	50	parts.
Oil of lemon	2	parts.

Make a fine powder, to be applied to the hands and feet, or to be sprinkled inside the gloves or stockings.

Perspiration, Prevention of.—

Acid tannic	2	scr.
Aqua rosal	½	oz.
Spt. vin. rect	2½	oz.
Aquæ	3	oz.

Use as a wash, each night and morning, with a soft sponge. The skin should be thoroughly cleansed with soap and warm water, and carefully dried, and then apply the wash as directed.

Perspiration Considered Medically.—Do not try to prevent perspiration. It is one of the requirements of a healthy body. Closing up the pores of the skin by the use of certain washes or powders to prevent excessive perspiration is a dangerous experiment. "The perspiratory glands of the skin are scattered everywhere throughout the integument, being most abundant on the anterior portions of the body. They consist each of a slender tube, about $\frac{1}{215}$ of an inch in diameter, lined with glandular epithelium, which penetrates nearly through the entire thickness of the skin, and terminates below in a globular coil, very similar in appearance to that of the ceruminous glands of the ear. These glands are very abundant in some parts. On the posterior portion

of the trunk, the cheeks, and the skin of the thigh and leg, there are, according to Krause, about 500 to the square inch; on the anterior part of the trunk, the forehead, the forearm, and the back of the hand and foot, 1,000 to the square inch; and on the sole of the foot and palm of the hand about 2,700 in the same space. The whole number of perspiratory glands is not less than 2,300,000, and the length of each tubular coil, when unraveled, about $\frac{1}{4}$ of an inch. The entire length must be not less than 153,000 inches, or about two miles and a half. The fluid derived from this extensive apparatus is the perspiration. It is a clear, colorless, watery liquid, with a distinct acid reaction. Its constitution is as follows: Water, 995·00; chloride of sodium, 2·23; chloride of potassium, 0·24; sulphate of soda and potassa, 0·01, salts of organic acids with soda and potassa, 2·02. Total, 1,000·00."

Petroleum Cement. See **Cements.**

Petroleum, to Deodorize.—Mix chloride of lime with petroleum in the proportion of three ounces for each gallon of the liquid to be purified. It is then introduced into a cask. Some muriatic acid is added and the mixture is well agitated, so as to bring the whole of the liquid into intimate contact with the chlorine gas. Finally the petroleum is passed into another vessel containing slaked lime, which absorbs the free chlorine and leaves the oil sufficiently deodorized and purified.

Pewter. See **Alloys.**

Pewter, Burnishing.—The burnishing of pewter articles is done after the work has been turned, or finished off with a scraper; the burnishers are of different kinds, for burnishing articles either by hand, or in the lathe; they are all of steel, and while in use are rubbed with putty powder on leather, and moistened with soapsuds.

Pewter, to Polish. See **Polishing.**

Pewter, to Solder. See **Soldering.**

Pharaoh's Serpents.—1. These are little cones of sulphocyanide of mercury which, when lighted, give forth a long, serpent-like, yellowish brown body. Prepare nitrate of mercury by dissolving mercury dioxide in strong nitric acid as long as it is taken up. Prepare also sulphocyanide of ammonium by mixing 1 volume sulphide of carbon, 4 strong solution of ammonia, and 4 alcohol. This mixture is to be frequently shaken. In the course of about two hours, the bisulphide will have been dissolved, forming a deep red solution. Boil this until the red color disappears and the solution becomes of a light yellow color. This is to be evaporated at about 80° F., until it crystallizes. Add little by little the sulphocyanide to the mercury solution. The sulphocyanide of mercury will precipitate; the supernatant liquid may be poured off, and the mass made into cones of about ¼ in. in height. The powder of the sulphocyanide is very irritating to the air passages, and the vapor from the burning cones should be avoided as much as possible. To ignite them set them on a plate or the like, and light them at the apex of the cone.

2. One grain of dry mercury sulphocyanide is mixed with some gum tragacanth which has previously been soaked in hot water. When the gum is completely softened, it is transferred to a mortar and the mercury sulphocyanide (in fine powder) is mixed with it by aid of a little water, so as to turn out a somewhat dry pill mass. This is then formed and cut into pellets of the desired size, which are dried on glass. These are very poisonous, and must be handled with care; do not inhale the fumes.

3. Potassium dichromate, 2 parts; potassium nitrate, one part; white sugar, 3 parts. Pulverize each ingredient separately, then mix them thoroughly. Make small paper covers of the desired size and press the mixture into them.

4. Harmless Pharaoh's Serpents.—A new method of making the curious chemical toys called Pharaoh's Serpents has been suggested by Vorbringer. The black liquor which results as a useless product when coal oil is purified with sulphuric acid is to be treated with fuming nitric acid. The dark colored resinous matter which swims on the surface is then collected, washed and dried, when it forms a yellowish brown mass having about the consistency of sulphur which has been melted and poured into water. When this mass is ignited it undergoes such a wonderful increase in bulk that a cylinder 1 in. long will give a snake about 4 ft. in length.

Phenol Phthalein Solution.—Dissolve 1 part of the solid in 100 parts of alcohol, 60%. On dropping an alkali in, the solution is reddened and bleached by acids.

Phenol Sodique.—Dr. E. Wildman, in the *Dental Times*, remarks that this preparation of carbolic acid is deservedly quite popular with the medical and dental professions, but its composition has not been made public. The following formula is the result of numerous experiments, and will give an article that will compare favorably with the best French phénol sodique:

Carbolic acid in crystals	188 grn.
Caustic soda	31 grn.
Pure water	4 fl. oz.

Mix.

The carbolic acid should be free from offensive odor, such as is prepared for medicinal purposes. When first mixed it is nearly colorless, but in time assumes a wine color; does not deposit any tarry residue, as is too often found in the commercial article. Carbolic acid has a feeble action as an acid, combining definitely with a very small portion of alkali. When the quantity of soda used was just sufficient to neutralize the carbolic acid, the compound did not appear to be as efficient as the one resulting from the above formula.

Phenyl Paper. See **Paper.**

Phosphate Solution.—Magnesium carbonate, 115 grn.; calcium carbonate, 115 grn.; potassium bicarbonate, 115 grn.; phosphoric acid, 2 oz.; water, 1 pt.

Phosphorescent Substances. See also **Paint,** *Luminous.*—Phosphorescence, or the emission of light without flame or sensible elevation of temperature, is a phenomenon exhibited in a greater or lesser degree by many substances—mineral, animal and vegetable—and is developed under a variety of conditions. In a few substances the light is developed by chemical change or a process of slow combustion, as in the case of phosphorus, from which the name phosphorescence has been derived. In others the substance suffers no appreciable change, only requiring exposure to a strong light to shine themselves when taken into the dark. The diamond and many mineral substances develop light in this way, and it is supposed that these substances have the property of absorbing light in the same way they do heat, and of slowly parting with it when taken into the dark, much in the same way that hot bodies part with their heat when removed from the source of heat.

With some of these substances the application of heat causes the development of brighter light (though for a shorter time than would be otherwise required to exhaust the supply), and again, there are some substances, such as fluorspar, that absorb light, but do not give it out until heated.

Many substances also become phosphorescent while crystallizing.

The color of the light developed by many of these substances varies with their nature and the degrees of heat to which they have been exposed. A certain scale of light and color may, therefore, be produced by grouping to-

gether different substances or samples of the same substances previously heated at different temperatures.

The fololwing are methods for preparing some of these pyrophors:

Barium Sulphide.—Finely powdered barium sulphate, free from iron, is formed into balls with gum tragacanth; the balls are dried at a moderate temperature, then placed in a crucible with a luted cover, and kept at a red heat for an hour. They are then allowed to cool slowly, and while still warm are transferred to glass stoppered bottles.

A better light is developed from the following charge:

Barium sulphate (C. P.).....	.32 parts.
Magnesium carbonate (C. P.)....	1 part.
Sulphur (C. P.).....	1 part.
Gum tragacanth.....	q. s.

This is heated in the crucible as before described.

Strontium Sulphide.—

Strontium sulphate (C. P.).....22	parts.
Sulphur (C. P.).....	1 part.
Gum tragacanth.....	q. s.

Proceed as before.

Calcium Sulphide. (Canton's Phosphorus.)—Calcine clean oyster shells to whiteness in a crucible, separate the clearer portions, reduce these to a fine powder, and place in layers with intermediate layers of flowers of sulphur in a crucible, cover and heat to dull redness for about half an hour. Cover the crucible tightly and let it cool slowly in the crucible.

Another method of preparing this phosporescent sulphide is to heat bisulphide of lime—obtained by boiling lime in a little water with twice its weight of sulphur—in a covered crucible at a low red heat for one hour.

Calcium and Antimony Sulphides.—

Calcined oyster shells	3 parts.
Flowers of sulphur.....	10 parts.
Antimonic acid.....	1 part.

Mix intimately in fine powder and heat for half an hour in a covered crucible at low redness.

Chloride of Calcium.—Fuse chloride of calcium in a crucible and pour it out on a clean iron plate. As soon as it becomes cold enough, break it into pieces and transfer to well stoppered bottles.

Calcium Nitrate.—Dissolve chalk or marble dust in nitric acid, evaporate to dryness, and fuse in a porcelain crucible.

These substances, when properly prepared and exposed to any strong light for a short time, exhibit phosphorescence for some time after removing to a dark place. A calcium sulphide has been prepared that, after a short exposure to sunlight, will continue to give out light for ten hours in the dark. When, by keeping in the dark, one of these substances has ceased to give out light, it may be made to give a series of fresh exhibitions by heating it first with the hand, then over a water bath, and finally on a hot stone plate.

A remarkable phophorescence is developed in quinia and some of its salts by heat. Spread quinia or its sulphate on a sheet of paper, and spread the paper on a plate of hot metal in a dark room—a strong phosphorescent light develops at the edges and spreads to the center. A similar display is observed in sprinkling finely powdered fluorspar (calcium fluoride) over a plate of hot metal in the dark.

Boracic acid fused and allowed to cool breaks into small pieces, and along the cracks a phosphorescent light appears, which is sometimes strong enough to be visible even in daylight. Potassium sulphate fused with cream of tartar shows the same phenomenon.

Phosphorus.—Phosphureted oil is the best means of exhibiting the luminous properties of phosphorus. A small piece of dry phosphorus, about the size of a pea, is placed in a test tube with a little pure olive oil. The test tube is held in the water bath until the oil becomes heated and the phosphorus liquefies; it is then shaken until the oil will take up no more phosphorus, and after allowing the oil to become clear, it is poured off inio a small glass vial provided with a glass stopper. Only a small quantity of this oil in the bottom of the vial is necessary. When it is shaken about so as to coat the sides of the vessel, and the stopper is removed so as to let the air get in, the oil coated sides of the glass become at once luminous, and continue so long as the stopper remains out. Characters written on paper with oil thus prepared (freshly), appear in the dark very brightly.

Phosphureted ether is prepared by digesting phosphorus in ether for some days in a tightly stoppered bottle. A piece of sugar dipped into this ethereal solution and then thrown into water makes the surface of the latter appear quite luminous in the dark.

Young experimenters must remember that phosphorus is very dangerous to handle when out of water, and often inflames spontaneously when exposed dry in the air.

Photographs. See **Photography.**

Photographs, Lacquer for. See **Lacquers.**

Photography.—The subject of photography has received much attention in compiling this book. Only those formulas were selected that came from undoubted authorities. The receipts do not form merely a collection of old receipts of the collodion process, but are the very latest that could be obtained, and the subject of photography has been thoroughly revised as the book passed through the press, and it is hoped the result will prove a valuable acquisition to the art science. Speciea attention has been given to the Eikonoger developer which is considered the best. Look for the main subjects, as *Developers*, *Toning Baths*, etc.

Aphorisms, Photographic.—1. When focusing, remember that the nearer the camera is to the subject the further away must the ground glass be from the lens, and vice versa.

2. Always endeavor to shade the lens as much as possible, and the resulting picture will have its brilliancy proportionately augmented. Many landscape artists use a large cone-shaped hood on the lens for this purpose.

3. On a hot summer day the atmosphere is often hazy and highly charged with non-actinic light, while after, or even during a shower of rain the atmosphere is clear and bright.

4. Give your plants full exposure; over exposure is more easily corrected in the developer than is under exposure.

5. Clouds, being eight or ten times more actinic than the rest of the picture, will be proportionately over exposed, and unless they receive much less exposure than the foreground, which may be attained by the use of a drop shutter, they will appear in the finished picture as a blank space. They may, however, be afterward printed in from a separate negative by what is termed combination printing.

6. The color of the object is a great factor in the exposure required; whites and blues are rapid; red, brown, yellow, etc., are slow, according to their actinism.

7. Buildings taken full front elevation never look well; the camera should be placed in a position to include the front and one side, showing the building in perspective.

8. When the two sides of a picture are very similar, as in a street scene, for example, symmetry should generally be avoided. By placing the camera a little to one side, and pointing the lens at the other, the facsimile of the sides may be subdued.

9. Aim at the quality rather than the quantity of the views taken.

10. Remember that photography, being a witness, needs to be treated with much judgment, lest it tells lies. Also that those who use the most art betray the least. And lastly, never go forth without a large reserve of patience, as it is sure to be needed. See also *Negative, Failures, Photographing.*

Autotypes, Flexible Supports for.—Yellow resin, 6 dr.; yellow beeswax, 2 dr.; rectified spirits of turpentine, 20 oz.

Backgrounds, Photographic.—Purchase close-grained packing canvas cloth. Tack on frame and pull out projecting fibers. The cloth does not need to be stretched too tight, as it shrinks when painted. Coat it two or three times with the following mixture:

Low grade of gelatine	½ lb.
Water	1 gal.
Molasses	2 oz.
Whiting	¼ lb.

Sandpaper after drying to make it smooth, then paint with one coat of ordinary oil paint. The white lead ground in oil is thinned with turpentine and mixed with lampblack, part of which has been ground in oil, and part in powder. The color should be a dark brown. One coat of flatting is next put on, usually by two persons, one to paint and the other to dab with a soft brush. A drab colored cloth, merino or woolen, answers very well.

Backing Prints to Prevent Halation. See *Halation.*

Baths, Silver, to Clear.—Agitate with China clay or kaolin.

Baths, Silver, to Renovate.—1. Dilute with 3 volumes of distilled water, expose to sunlight, filter, add sodium carbonate till slightly turbid. Expose to sunlight six hours more, filter, add sodium carbonate till the silver is all thrown down. Wash precipitate by decantation, then dissolve in nitric acid. Filter again, make up to 35 grm; neutralize, expose to the sun a week, and the bath is ready for use.

2. Neutralize with ammonia till just alkaline; boil till black; let it cool, filter, acidify with pure nitric acid and evaporate to crystallization, then fuse. When cool add distilled water, shake and let stand exposed to light. Filter and add drained crystals; dissolve and make solution acid with pure nitric acid. Expose again to sunlight, filter, and the bath is ready for use.

3. Add potassium permanganate, expose to sunlight, filter, acidify, put in clean bottles four-fifths full, cork and freeze in a tray; thaw gradually till a ball of ice ⅛ size of the bottle remains. Remove this and use the rest. [This receipt should be used with caution, if at all; if the freezing is carried too far the bottle will inevitably be broken.—ED.]

To Blacken Cameras.—A good dead black is made as follows: Mix drop black, ground in turps, with gold size and turps—enough gold size to keep the black from rubbing off when dry.

Blisters, to Prevent.—After toning, immerse in a mixture of 8 parts methylated spirit and 2 parts of water.

Blistering of Albumen Paper.— 1. Have the room warm, but do not dry the paper by excessive heat.

2. Avoid acidity in solutions. Test with litmus paper. Moisten the print before washing with a sponge saturated in alcohol.

3. Add a slight trace of ammonia to the hypo.

4. Soak the print before fixing in a weak alum bath.

Blue Prints.—Float the paper for one minute in a solution of—

Ferricyanide of potash	1 oz.
Water	5 oz.

Dry it in a dark room and then expose beneath negative until the dark shades have assumed a deep blue color; then immerse the print in a solution of—

Water	2 oz.
Bichloride mercury	1 grn.

Wash the print and then immerse it in a hot solution of—

Oxalic acid	4 drm.
Water	4 oz.

Wash again and dry.

For other prints in red, etc., see *Printing Processes* below.

Blue Print Process.—1. Cover a flat board, the size of the drawing to be copied, with two or three thicknesses of common blanket or its equivalent.

2. Upon this place the prepared paper, sensitive side uppermost.

3. Press the tracing firmly and smoothly upon this paper by means of a plate of clear glass laid over both and clamped to the board.

4. Expose the whole in a clear sunlight from four to six minutes. In a winter's sun from six to ten minutes. In a clear sky from twenty to thirty minutes.

5. Remove the prepared paper and pour clear water on it for one or two minutes, saturating it thoroughly, and hang up to dry.

The sensitive paper may be readily prepared, the only requisite quality in the paper itself being its ability to stand washing.

Cover the surface evenly with the following solution, using such a brush as is generally employed for the letter press: One part soluble citrate of iron (or citrate of iron and ammonia), 1 part red prussiate of potash and dissolve in 10 parts of water.

The solution must be kept carefully protected from light, and better results are obtained by not mixing the ingredients until immediately required. After being coated with the solution the paper must be laid away to dry in a dark place, and must be shielded entirely from light until used. When dry, the paper is of a yellow and bronze color. After exposure the surface becomes darker, with the lines of the tracing still darker. Upon washing the characteristic blue tint appears, with the lines of the tracing in vivid contrast. Excellent results have been obtained from glass negatives by this process.—*R. W. Jones, Proc. Eng. Club, Phila.*

3. Use two separate solutions of—

Iron and ammonium citrate	1 oz.
Water	4 oz.

and—

Potassium ferricyanide	1 oz.
Water	4 oz.

For use, mix equal quantities and float paper for two minutes.

Blue Prints, to Change to Brown.—

Borax	2½ oz.
Hot water	38 oz.

When cool add sulphuric acid in small quantities until blue litmus paper turns slightly red, then add a few drops of ammonia until the alkaline reaction appears and red litmus paper turns blue. Then add to the solution 154 grn. of red crude gum catechu. Allow it to dissolve with occasional stirring. The solution will keep indefinitely. After the print has been washed out in the usual way, immerse it in the above bath a minute or so longer than it appears when the desired tone is reached. An olive brown or a blackish brown is the result.

To Make Blue Prints Green.—Make four solutions as follows:

Solution A.—Water 8 oz and a crystal of nitrate of silver as big as a pea.

Solution B.—Hydrochloric acid 1 oz. and water 8 oz.

Solution C.—Pour a solution of iodide of potassium (iodide of potassium 1 oz. and water 8 oz.) into a saturated solution of bichloride of mercury until the red precipitate is just dis-

solved, and then add four times as much water as the resulting solution.

Solution D.—Water, 16 oz., and iodide of potassium, 1 drm.

Then take the blue print and bleach it with solution A, when the image will become pale slate color or sometimes a pale yellow.

Then wash thoroughly and immerse the print in solution B, when the image will again become blue.

Then, without washing, immerse the print in solution C, when the image will become green but the "whites" will be of a yellow tint.

Then put the print in solution B again, without washing.

Then wash and pour solution D over the print to purify the whites and to give the green image a bluer tint; but do not leave print in this solution too long, as it has a tendency to make the print blue again.

Converting Blue Prints into Brown Prints.—Immerse the blue print after it is dried in a solution of aqua ammonia containing 22 per cent. am. gas, 2 parts; distilled water, 18 parts. Leave the print in this solution from two to four minutes, or until the blue color entirely disappears, then rinse in clear water, and plunge in a filtered solution of tannic acid, 2 parts; distilled water, 100 parts. Keep in this solution about twelve hours. If not as dark as desired, intensify by adding to the bath a few drops of ammonia water. Take out after a few minutes and wash thoroughly. The prints resemble sepia drawings. A greenish tone may be given blue prints by immersing after washing in a 1 per cent solution of sulphuric acid.

Obtaining Warm Brown Tones on Bromide Paper or Lantern Slides.—Two formulæ given by Mr. Robert Talbot in the *Photographische Neuheiten*, the author states, have proved to be very successful in his hands:

1. With uranium nitrate. This method is very well suited for Eastman positive paper, as well as for transferrotype paper. After the prints have been fixed, washed, and eventually transferred, the following two solutions are prepared:

Solution A.

Ferricyanide of potassium	5 grm.
Water	500 c. c.

Solution B.

Uranium nitrate	5 grm.
Water	500 c. c.

Just before use, equal parts of solutions A and B are mixed. The print is immersed in the solution until the desired tone has been obtained, then washed thoroughly, and placed once more in the fixing bath.

Water	100 c. c.
Hyposulphite of soda	20 grm.

After five minutes it is removed and well washed. The above gives warm red tones. Warm brown tones are obtained if the print is allowed to remain in the above bath until it begins to acquire a brown color; it is then immersed in a weak alum solution, when it is rinsed, fixed as above, and again thoroughly washed.

2. With potassium chloride. Three solutions are prepared:

Solution A.

Water	1,000 c. c.
Potassium oxalate	330 grm.

Solution B.

Water	1,000 c. c.
Potossium chloride	130 grm.

Solution C.

Water	500 c. c.
Sulphate of iron	24 grm.
Citric acid	2 grm.
Potassium bromide	2 grm.

The paper should be fully exposed, and then soaked in clean water. Then mix.

Solution A	20 c. c.
Solution B	5 c. c.
Solution C	5 c. c.

The more of B, if taken, the browner will be the tone. The print is cleared, fixed, and washed as usual.—*Photo News.*

Silver Bromide Emulsions.—Over exposed gelatino bromide prints may be cleared by treating them with a very dilute solution of potassium cyanide, to which a small quantity of iodine has been added. Fog at the edges of the paper may be removed by applying a somewhat stronger solution with a brush, care being taken not to touch the image.—*C. T. F. Phot. A.*, xxxi.

Bromide prints on paper or opal may be toned with the Obernetter toning solution for gelatino-chloride paper, viz.: (A) Gold chloride, 15 grn.; sodium acetate, 1 oz.; water, 39 oz. (B) Gold chloride, 15 grn.; ammonium sulphocyanide, 300 grn.; water, 39 oz. Mix 10 parts of A with 3 parts of B. Wash thoroughly after toning.—F. Golby; *Y. B. Photo.*, 1891.

Another toning formula, designed especially for Eastman's paper, is ammonium sulphocyanide, 120 grn. (120 parts); gold chloride, 4 grn. (4 parts); water, 16 oz. (7,000 parts). The prints must not be left in after they become blue gray, or they will be deep blue when dried. This last color is suitable for moonlight effects. —H. W. B. Bruno.

Developing formulæ: (D) Hydrochinon, 80 grn.; sodium sulphite, 240 grn.; water, 10 oz. (A) Sodium carbonate solution, saturated at 60° F. Mix in equal volumes, and dilute the mixture with its own volume of water.—Pringle, *A. Phot.*, xi.

(D) Hydrochinon, 80 grn.; potassium bromide, 15 grn.; sodium sulphite, 1 oz.; water, 20 oz.; citric acid, 60 grn. (A) Potassium carbonate, 2 oz.; sodium carbonate, 2 oz.; water, 20 oz. Mix in equal proportions; gives warm tones.—B. Alfieri, *A. Phot.*, xi.

(D) Eikonogen, 15 parts; sodium sulphite, 60 parts; water, 600 parts. (A) Potassium carbonate, 24 parts; water, 600 parts; mix in equal proportions, and add few drops 10% potassium bromide solution.—Carbutt, *Phot. T.*

Eikonogen, 4 grn.; sodium sulphite, 32 grn.; lithium carbonate, 2 grn.; water to 1 oz. —Cowan, *Phot. N.*, xxxiv.

Quinol, 2 grn.; sodium sulphite, 8 grn.; potassium carbonate, 10 grn.; water to 1 oz.—Cowan, *ibid.*—[*Quinol = Hydrochinon.*—Ed.]

Bromide Prints, to Secure Pure Whites in.—If the whites of bromide prints are found on completion to be yellowed, the stain can be completely removed by immersing the print after fixing, and thorough washing in a strong solution of tartaric acid, keeping it in the solution for an hour or more, if necessary, and finally washing in clean water.

Burnishing, Lubricator for.—

A.

1. Paraffine	8 drm.
Benzine	10 oz.

B.

Gum ammoniacum	30 grn.

Alcohol, quantity sufficient to prevent the gum from sticking to the pestle while grinding the gum in a mortar. Add A and B together, and shake well and apply with a flannel or rag The above gives a fine polish.

2. *Lubricator for Hot Burnishing.*—

Cetaceum	1 part.
Castile soap	1 part.
Alcohol	100 parts.

3. Glacè Lubricator.—If a greater polish is desired than can be produced by the ordinary soap and alcohol lubricator, the following may be employed: Alcohol, absolute, 4 fl. oz.; Castile soap (white), 25 grn.; permaceti, 25 grn. Dis-

solve by heat; add 1 fl. oz. chloroform. Apply in the usual manner. Dry thoroughly, and remove all traces of the lubricator with a piece of Canton flannel. Burnish; have the burnisher quite hot. (Swain.)

4. *Burnishing Solution.*—

Castile soap	4 grn.
Alcohol (90%)	1 oz.

Rub on the surface of the print, allow to dry, then burnish.

Carbon Tissue, Sensitizing Solution for.—Potassic bichromate 1½ oz.; water, 30 oz.; ammonia, at least 1½ drm. No more ammonia should be used than will change the reddish color of the bichromate solution to yellow.

Catechol. See *Developers.*

To Cleanse the Hands from Silver and Iron Stains.—Dilute hydrochloric acid to half its strength; or, better still, chloride of lime in strong solution; pour ¼ oz. of this on the hands, and rub well in till the stains disappear. Next rinse the hands and apply a little dilute solution of potassium oxalate.

To Clean Negatives Stained by Silver.—Make a weak solution of cyanide potassium. Rub the negative gently all over with a plug of cotton wool well wet in this solution, rubbing a little harder on the stained parts. Wash the negative well, and dry on blotting paper. If desired to revarnish, the plate may be flooded once or twice with methylated spirit. After drying it may be varnished in the ordinary way.

Clearing Solution (Edwards').—

1. Alum	1 oz.
Citric acid	1 oz.
Sulphate of iron	3 oz.
Water	20 oz.

Soak for a minute or two, when clearing should be complete.

2. Clearing Solution for Pyro Negatives.—(J. Hay Taylor.)—Alum, 2 oz.; hydrochloric acid, 2 fl. oz.; boracic acid, 1 oz.; water, 32 fl. oz. The solution can be used over and over again. It will do its work in ½ minute. The negative should be well washed.

3. Clearing Solution for Gelatine Bromide Plates.—Alum, 2 oz.; citric acid, 2 oz.; sulphate iron, 6 oz.; water, 40 oz.

4. Sometimes by prolonged development negatives become stained, and usually clearing solutions are employed after the negative is fixed.

Mr. T. Bedding, in the *British Journal of Photography*, advises the use of an alum and citric acid bath, one part of citric acid to thirty of alum, before fixing. When the developer has been poured off the negative, the latter has been washed in a couple of changes of water, and the clearing solution applied for a few minutes, after which it may be returned to the bottle for future use. It is then important that the negative be carefully washed prior to immersion in the fixing bath.

5. Saturated solution of alum, 10 fl. oz.; hydrochloric acid (commercial), ½ oz. After fixing and washing the negative, immerse in the above solution. Wash well.

6. Negatives which, after development by ferrous oxalate, are opalescent from oxalate of lime, are immersed in the following solution:

Water	100 parts.
Oxalate of iron	2 parts.
Alum	8 parts.

By which the opalescence will be completely cleared, and the whites of the negative will remain transparent.

7. Clearing Solution (Cowel's).—

Alum	2 oz.
Citric acid	1 oz.
Water	10 oz.

Wash moderately after fixing, and immerse the negative in the above.

8. Saturated solution of alum..... 20 oz.
Hydrochloric acid (commercial)... 1 oz.

Immerse the negative after fixing, having previously washed it for two or three minutes under the tap; wash well after removal from the alum and acid.

9. Chautauqua Clearing Solution.—Alum, 2 oz.; water, 30 fl. oz.; citric acid, ½ oz.

Clouds, Photographing of.—The best time to photograph clouds is in the spring, say March or April, when, after a storm, the heavy cloud banks assume fantastic forms To successfully photograph clouds, the photographer must take up a position where his view will be unobstructed by trees, houses, telegraph posts, chimneys, or other high objects. Then focusing upon the extreme distance, and including but a small portion of the landscape in his picture, let him, if he has not fixed upon the cloud, wait until the effect is most striking, then with a rapid shutter and a medium stop, say, f/22 and a slow plate, let him make his exposure. Development should not be too heavy, and should be stopped when all detail is fully out and sufficiently dense not to disappear in the fixing. With a suitably selected and properly developed negative of cloudland, landscape pictures can very frequently be considerably improved by the operation of printing in from the cloud negatives.

Clouds, Printing in.—Many pictures are improved by the addition of clouds. A bare expanse of white sky is very rarely attractive. To do this, special cloud negatives must be made or purchased. It is essential, to secure a satisfactory and pleasing effect, that the cloud should be lit from the same direction as the negative. Having made a suitable selection of two negatives, a print is first taken of the landscape. If the negative is very dense in the sky it will print out quite white. Two prints should be taken, one to make the final picture, the other to serve as a mask. This must be carefully cut through along the line dividing the blank sky from the objects in the picture. Fine branches of trees and such like projections need not be troubled with. Having carefully fitted this mask over the printed portion of the picture, it is placed in contact with the cloud negative and printed in the usual way, the mask protecting the lower portion of the printed picture from further action of the light. If the sky portion of the original negative is thin and it would in the ordinary course of printing print out more or less tinted, the sky must be blocked out. This can be done by running a brush filled with vermilion along the face of the negative for an eighth of an inch above the sky line, and then cutting a rough mask of paper and pasting on to meet this and cover up the rest of the sky. This will enable the sky portion to print perfectly white, when it is ready for the reception of the cloud impressions in the manner just described.

Collodio Bromide Emulsion.—

Ether, s. g. 0·720	4	fl. oz.
Alcohol, s. g. 0·820	2½	fl. oz.
Pyroxyline	40	grn.
Castile soap dissolved in alcohol	30	grn.
Bromide of ammonium and cadmium	56	grn.

Dissolve 125 grn. nitrate of silver in 1 oz. boiling alcohol and sensitize the emulsion by adding 1 drm. of the silver solution at a time, thoroughly stirring with a glass rod until the silver is well incorporated. After the whole has stood for twelve hours, add 30 grn. more of the double bromide of ammonium and cadmium dissolved in ½ oz. alcohol. After standing for a few hours longer the emulsion is poured into a flat dish and allowed to evaporate and dry. It is then washed with distilled water by repeated soakings until all the soluble salts are removed. After drying it is again re-

dissolved in equal parts of alcohol, at the rate of from 20 to 24 grn. to the oz. of solvents. Then it is ready for use, and plates may be used wet or dry.

Collodion Formula.—Mix 6 oz. sulphuric acid, 4 oz. nitric acid at 1·450 sp. gr. and 2 oz. water. The temperature will rise to about 170° F., 77° C. When it is cooled down to about 100° F., 38° C., immerse perfectly dry cotton wool, best carded and of long fiber, pull it in under the acid with a piece of glass rod, and let each piece be well saturated before adding another. Cover the vessel and leave it for twelve to twenty hours in a situation where any fumes generated may escape into the outer air. Next lift the cotton out and plunge it quickly into a large quantity of water, separating the tufts with pieces of glass; wash in changes of water till no acid is left. Wring the cotton in a coarse towel as dry as possible, and then pull out the tufts and place them in the air to dry. Collodion made with this cotton will be very soluble and leave no sediment; 5 to 6 grn. will dissolve in 1 oz. mixed ether and alcohol and still the collodion will be very fluid.

To prepare one pint of collodion with above—

1. Alcohol	10	oz.
Sulphuric ether	5	oz.
Cotton as above	100	grn.
To Iodize—		
2. Alcohol	5	oz.
Ammonium iodide	60	grn.
Cadmium iodide	30	grn.
Cadmium bromide	20	grn.

Shake till dissolved and then pour into 1.

Another plan, better for small quantities:

Dissolve the iodides, as above, in 10 oz. alcohol, then put in 100 grn. cotton and shake well. Lastly, add 10 oz. ether and shake till cotton is dissolved. This collodion will be ready for use in a few hours, but will improve with age.

For Washed Eumlsion (for Transparencies—

Ether, s. g. 720	5	fl. oz.
Alcohol, s. g. 0·820	3	fl. oz.
Pyroxiline or papyroxyline	60	grn.
Bromide of cadmium and ammonium	100	grn.
Or Bromide of zinc	96	grn.
Hydrochloric acid, s. g. 1·2	8	min.

Sensitize with 20 gr. of nitrate of silver to each oz. dissolved in a minimum of water with 2 dr. of boiling alcohol. Allow to stand for two or three days.

N. B.—In the last three formulæ, the emulsion, after being allowed to ripen for the time stated, should be poured into a dish and allowed to become thoroughly dry. The mass of dry emulsion is then washed, to remove all the soluble salts, and is then again dried and redissolved in equal parts of ether and alcohol at the rate of from 20 to 24 gr. to the oz. of solvents.

Organifiers (for Unwashed Emulsions).—For Landscape Work.—

1. Tannin	½	oz.
Gallic acid	60	gr.
Water	20	fl. oz.
2. Tannin	300	gr.
Water	20	fl. oz.

For Landscapes or Transparencies (warm, brown tone).—

3. Freshly ground coffee	1	oz.
Boiling water	1	pt.

For Transparencies (brownish black tone.)—

4. Tannin	30	gr.
Pyrogallic acid	60	gr.
Water	20	fl. oz.

Developing Solutions for Collodion Emulsion.

A. Pyrogallic acid	96	gr.
Alcohol	1	fl.oz.
B. Bromide of potassium	10	gr.
Water	1	fl. oz.
C. Liquor ammonia, s. g. 0·880	1	fl. dr.
Water	15	fl. dr.
D. Carbonate of ammonia	2	gr.
Water	1	fl. oz.

For each drm. of developer take, for a normal exposure, 5 min. of A, 1 or 2 min. of B, and 1 or 2 min. of C; or if D be used, add the above quantities of A, B and C to 1 drm. of D. When the details of the image are out, add double the quantities of B and C.

Intensifying Solutions for Collodion Emulsion.—

Nitrate of silver	60	gr.
Citric acid	80	gr.
Nitric acid	30	min.
Water	2	oz.

To each drm. of a 3 grn. solution of pyrogallic acid add 2 or 3 min. of the above, and apply until sufficient density is attained.

Collodion Bottles, to Clean.—Leave the stopper out until all the ether and alcohol have evaporated; when dry, remove the film with water and a bottle brush. Rinse with alcohol.

Dry Collodion Processes.—Pyroxyline.—For Collodio Bromide or Unwashed Emulsion.

Nitric acid, sp. gr. 1·45	2	fl. oz.
Sulphuric acid, sp. gr. 1·845	4	fl. oz.
Water	1	fl. oz.
Cotton (cleaned and carded)	100	grn.
Temperature	150°	F.

Time of immersion, ten minutes.

1. For Washed Emulsion.—

Nitric acid, sp. gr. 1·45	2	fl. oz.
Sulpuric acid, sp. gr. 1·845	6	fl. oz.
Water	1	fl. oz.
Cotton (cleaned and carded)	100	grn.
Temperature	140°	F.

Time of immersion, ten minutes.

2. Nitric acid, sp. gr. 1·45	2	fl. oz.
Sulphuric acid, sp. gr. 1·845	3	fl. oz.
White blotting paper	145	grn.
Temperature	100°	F.

Time of immersion, thirty minutes.

Collodio-Bromide Emulsion.—

Ether, sp. gr. 0·720	5	fl. oz.
Alcohol, sp. gr. 0·820	3	fl. oz.
Pyroxyline	50	grn.
Bromide of cadmium and ammonium	80	grn.
or Bromide of zinc	76	grn.

Sensitize by adding to each oz. 15 grn. of nitrate of silver, dissolved in a few drops of water and 1 drm. of boiling alcohol. This is suitable for slow landscape work or for transparencies.

1. Washed Emulsion (for Landscapes).		
Ether, sp. gr. 0·720	4	fl. oz.
Alcohol, sp. gr. 0·820	2¾	fl. oz.
Pyroxyline	40	grn.
Castile soap (dissolved in alcohol)	30	grn.
Bromide of ammonium and cadmium	84	grn.

Sensitize with 100 grn. nitrate of silver dissolved in 1 oz. boiling alcohol; and after standing ten days, add a further 20 grn. silver dissolved as before in 2 drm. alcohol.

2. Rapid.—		
Ether, sp. gr. 0·720	4	fl. oz.
Alcohol, sp. gr. 0·820	2½	fl. oz.
Pyroxyline	40	gnr.
Castile soap	30	grn.
Bromide of ammonium and cadmium	56	grn.

The Wet Collodion Process.—Iodized Collodion (for Negatives).—

Ether, sp. gr., 0·725	10	fl. oz.
Alcohol, sp. gr., 0·805	8	fl. oz.
Pyroxyline	120	grn.
Iodide of ammonium	12	grn.
Iodide of cadmium	20	grn.

Bromo-Iodized Collodion (for Negatives).—

Ether, sp. gr.. 0·725	10 fl. oz,
Alcohol, sp. gr., 0·805	10 fl. oz.
Pyroxyline	120 grn.
Iodide of ammonium	40 grn.
Iodide of cadmium	40 grn.
Bromide of cadmium	20 grn.

Bromo-Iodized Collodion (for Positives or Ferrotypes).—

Ether, sp. gr., 0·725	10 fl. oz.
Alcohol, sp. gr., 0·805	10 fl. oz.
Pyroxyline	100 grn.
Iodide of cadmium	50 grn.
Bromide of ammonium	20 grn.

The Nitrate Bath (for Negatives).—

Nitrate of silver (recrystallized).	6 oz.
Distilled water	80 fl. oz.
Nitric acid (pure)	10 min.

Saturate with iodide of silver and filter.

For Positives or Ferrytypes.—

Nitrate of silver (recrystallized).	5 oz.
Distilled water	80 fl. oz.
Nitric acid (pure)	12 min.

Saturate with iodide of silver and filter.

Developer.—For Negatives.—

1.	Protosulphate of iron	¼ oz.
	Glacial acetic acid	¼ oz.
	Alcohol	½ oz.
	Water	8 oz.
2.	Protosulphate of iron	15 grn.
	Acetate of soda	15 grn.
	Glacial acetic acid	30 min.
	Alcohol	30 min.
	Water	1 oz.
3.	Protosulphate of iron	1 oz.
	Glacial acetic acid	1 oz.
	Citric acid	½ drm.
	Water	1 pt.
4.	Ammonio-sulphate of iron	75 grn.
	Glacial acetic acid	75 grn.
	Sulphate of copper	7 grn.
	Water	3 oz.
5.	Protosulphate of iron	7 drm.
	Water	20 oz.
	Collocine	2 sm. drp.
	Alcohol	q. s.

This developer can also be used for glass positives and ferrotypes.

For Collodion Positives or Ferrotypes.—

Protosulphate of iron	1½ oz.
Nitrate of baryta	1 oz.
Water	1 pt.
Alcohol	1 oz.
Nitric acid	40 drp.

For Collodion Transfers.—

Pyrogallic acid	5 grn.
Citric acid	3 grn.
Acetic acid	45 min.
Water	1 oz.
Alcohol	q. s.

Intensifying Solution.—

A.

Pyrogallic acid	3 grn.
Water	1 oz.

B.

Nitrate of silver	10 grn.
Citric acid	20 grn.
Acetic acid	1 drm.
Water	1 oz.

For use, mix in a few drops of B with enough of A to cover the surface of the plate.

Curling, to Prevent Prints from.—1. Try a very little glycerine in the toning and fixing baths.

2. A more correct heading of this receipt would perhaps be to flatten prints after they are curled. Lay the photograph face down upon a pad composed of several sheets of paper and place upon it at the left-hand margin a straight and rather sharp edge of a smooth ivory or boxwood rule. Move the rule slowly to the right, and with the left hand raise up the margin of the print nearest to that hand, pulling up rather strongly, yet so as not to allow the print to drag over the pad upon which it is laid. This will flatten the print and remove any further tendency to curl.

3. Immerse the finished prints in the following solution for a few minutes:

Water	1 parts.
Alcohol	4 parts.
Glycerine	3 part.

4. Gelatine Paper Prints, to Prevent the Curling of.—After the print has been fixed and washed, it is immersed for a few minutes in a 5% solution of glycerine and water, then removed, and directly squeegeed on a sheet of smooth hard rubber, then left to dry. When pulled off, it will lie as flat as a sheet of glass.

Daguerreotypes, to Restore.—Daguerreotypes do not fade, but become stained if much exposed to air and dampness, and need cleaning. To clean daguerreotypes according to P. C. Duchochois, take hold of the daguerreotype with pinchers by one corner, and, keeping the plate level, cover it with a solution of potassium cyanide (1 part to 25 of water), and if the picture be much stained, heat it moderately with an alcohol lamp for fifteen or twenty seconds, when the solution is thrown off and the plate rinsed. This done, flow the plate with clear water, heat it as before, and holding it then almost vertically, dry it; in commencing, heat it at one of the upper corners and dry the water by blowing upon it toward the opposite corner. The whole operation should be quickly done, and the plate not too strongly heated, especially when covered with cyanide; otherwise the image might be obliterated. The daguerreotypes may be dusted with a fine camel's hair brush, but not touched with the fingers nor rubbed with any hard material. They are very easily scratched.

To Clean a Tarnished Daguerreotype.—Wash the plate gently, pour on carefully a 3% solution of cyanide of potassium. Keep the plate in motion. Keep the solution only a short time on the plate, pour off, and wash well. If the tarnish remains, pour on more solution, repeat until the plate is clean. Wash with distilled water, and dry over a flame. Blow on the plate constantly, so that the water may be driven off evenly.

Negatives, Density of, Reducing.—Solution for Reducing Over Density.—1.

A.

Hyposulphite of soda	2 oz.
Water	1 pt.

B.

Ferrocyanide of potassium	2 drm.
Water	5 oz.

Mix ½ oz. of B with 5 oz. of A just before use.

2. According to the *Beacon*, the following formula of L. Belizki is said to possess several advantages over Farmer's well known potassium ferricyanide and hypo. It must be mixed in the order given.

Water	200 parts.
Potassium ferric oxalate	10 parts.
Sodium sulphite (neutral)	8 parts.
Oxalic acid	3 parts.
Sodium hyposulphite	50 parts.

It will retain its working strength if kept in the dark, and may be used over and over so long as it has a green color.

3.	Red prussiate of potash	30 grm.
	Water	500 c. c.

Hypo. Solution.—

Hypo	30 grn.
Water	500 c. c.

4. In cases of error in development the negative is too intense. The high lights may be safely reduced by the method of Mr. Howard Farmer, viz.: Ferricyanide of potassium (red prussiate of potash) 1 oz.; water, 16 oz.; hyposulphite of soda, 1 oz.; water, 16 oz.; immerse the negative in sufficient hypo solution to cover it, to which have been added a few drops to each ounce of the above ferricyanide solution; the speed of reduction depends on the quantity of ferricyanide present. When sufficiently reduced, wash thoroughly. To reduce locally, apply the mixed solution to the wet negative with a camel's hair brush to the parts requiring reducing.

5. There are three principal methods of reducing density:

a. The image may be changed in color, so as to be more transparent to actinic light. *b.* It can be partly converted into some compound, which can be dissolved out in hypo. or other solvent. *c.* The gelatine film can be reduced in thickness by solution or mechanical means.

Mr. W. E. Debenham's Method with Ozone Bleach.—Two solutions are required.—

No. 1.

Chrome alum.....1 oz.
Water.....1 pt.

No. 2.

The plate is immersed in a solution composed of ½ oz. of each of these in 5 oz. of water, and then in the hypo. bath. To reduce locally a stronger solution is poured in a stream on the part desired, the operation being repeated, if necessary.

6. Method with Chloride of Lime or with Eau de Javelle (hypochlorite of potash).—For the first a saturated solution of chloride of lime is prepared, and for the second.—

Chloride of lime..... 2 oz.
Carbonate of potash..... 4 oz.
Water.....40 oz.

The lime is mixed with 30 oz. of the water, and the carbonate dissolved in the other 10 oz. The solutions are mixed, boiled and filtered. Either of these are diluted and the plate immersed until the required reduction is produced; it is then passed through the fixing bath and washed. In these cases a double action occurs. part of film being dissolved off and a portion of the silver being converted into chloride, which is removed in the fixing bath.

7. Method with Ferric Chloride.—A solution is prepared with—

Ferric chloride.....1 drm.
Water.....4 oz.

The plate is immersed in this, which converts the silver into silver chloride, and on washing and immersing in the hypo. bath this is dissolved out.

8. Other Methods.—There are various other methods extant for reducing density. One or two, requiring only a single solution, have been found to answer very well.

No. 1.

Copper sulphate..... ½ oz.
Ammonia, sufficient.
Water.....1 pt.

The quantity of ammonia is such as to redissolve the precipitate first formed on adding it to the copper sulphate.

No. 2.

Potassium ferricyanide (red prussiate of potash).....1 oz.
Water.....1 pt.

A few drops of ether should be added to 1 oz. of the hypo. bath diluted with 4 oz. of water, and the plate immersed until the requisite reduction is obtained and washed. In the first case silver sulphate, and in the second silver ferrocyanide, are formed, and immediately dissolved out by the hypo.—*Br. Jour. of Photo.*

9. (Seed).—Saturated solution chloride of lime, 2 fl. oz.; water, 8 fl. oz. This solution should be poured over the negative in a tray. Soak for two or three minutes. Rub gently with the finger, the spot to be reduced, until the desired intensity is obtained. Wash five minutes and dry.

10. The Hypochlorite Method.—It is often advisable to harden the film by immersion for some minutes in a solution made by dissolving 80 to 100 grn. of chrome alum in a pt. of water, after which it is immersed in the following hyposulphite of potash solution until nearly sufficient reduction is effected. Finally immerse in the hyposulphite fixing bath, and thoroughly wash.

11. The Hyposulphite of Potash Solution.—Agitate 3 oz. of good chloride of lime (bleaching powder) with 30 oz. of water, then add 5 oz. of carbonate of potassium dissolved in 10 oz. of water; agitate well, and filter through calico.

Reducing Over Printed Proofs (Salomon's).—Immerse for a short time in the following solution: Cyanide of potassium, 10 grn.; liquid ammonia, 10 drops; water, 1 qt. Watch the prints carefully, and wash well.

Developers.—The following large collection of developers comprises all that are of any value, and the very latest formulas are published. The eikonogen developer is perhaps the best, and the developers using eikonogen and hydrochinon are also recommended.

Catechol.—Catechol (pyrocatechin) gives clear good printing negatives with less density and no greater detail for a given exposure than pyro or quinol, but has the advantage that it works well in dilute solutions. The following formula is given: (A.) Caustic potash, 10 parts; water, 1,000 parts. (D.) Catechol, 2 parts; sodium sulphite, 10 parts; water, 100 parts. Mix 5 parts of both with 100 parts of water, and, if necessary, add potassium bromide. The two solutions may be kept ready mixed.—L. Backelandt, *A. Phot. B.*, xxi., 77-79.

Eikonogen.—The eikonogen developer allows of much shorter exposure than with pyro, does not deteriorate, and is not poisonous, and gives a fine deposit on the negative. The solutions can be used until exhausted, and over exposure can be remedied by its use. Eikonogen is frequently contracted to eiko, aspyro, hydro, etc.

No. 1.

Distilled water.....20 oz.
Sulphite of soda crystals..... 2 oz.
Eikonogen crystals..... ½ oz. avd.

No. 2.

Distillod water.....20 oz.
Carbonate of potash..... ¾ oz.

Mix Nos. 1 and 2 in equal parts, and to each ounce add 2 to 4 drops 10% solution bromide of sodium. A few drops of a 10% solution caustic soda will give additional energy for instantaneous exposures. The after treatment is same as with any other developer.

Although the above developer will keep if made up in one solution, we recommend making up stock in separate solutions, and mixing as wanted. The mixed developer can be kept in separate bottles for future use.

A mixture of equal parts eikonogen and hydrochinon developer yields lantern slides of great beauty, and we strongly recommend it also for negatives.

2. Eikonogen Developer for Short Exposures.—Distilled water, 100 parts; sulphate of soda, 40 parts. Dissolve and add crystallized eikonogen, 10 parts; caustic potash, 10 parts. For use dilute with three to ten times its value of water.

3. An eikonogen developer, said to be very simple, and to work good for lantern slide plates, is advised by T. A. Sinclair.

No. 1.

Eikonogen	½ oz.
Sulphite soda	2 oz.
Water	20 oz.

No. 2.

Washing soda	2 oz.
Carbonate of potash	2 oz.
Water	20 oz.

Take one ounce of No. 1, half an ounce of No. 2, and add half an ounce of water. This will develop eight or ten plates in succession.

4. Eikonogen and Soda Developer.—

A.

Sodium sulphite (crystals C. P.)	4 oz.
Distilled water	60 oz.
Eikonogen	2 oz.

B.

Sodium carbonate (crystals)	3 oz.
Distilled water	20 oz.

Dissolved in order named. A developer is made by adding to 3 oz. of A 1 oz. of B.

Single Solution, Eikonogen and Soda Developer.—

Sodium sulphite (crystals C. P.)	4 oz.
Sodium carbonate	3 oz.
Distilled water	80 oz.
Eikonogen	1 oz.

Dissolve in the order named. Add a few drops of the hypo. solution during development. All of the formulas are based on 437½ grn. to the oz.

The usual alum and fixing baths may be employed.

5. With any developer that may be devised it is impossible to produce an image if the light has had no effect on the sensitive film, as is the case when a plate is described as being rather under exposed. Generally such exposures only develop on the surface, as the light has not had time to affect the underlying particles of silver. We advise the use of the eikonogen and potash developer. If this fails to produce an effect, no other developer is likely to. Make the eikonogen as follows:

No. 1.

Warm water	40 oz.
Sulphite sodium	2 oz.
Eikinogen	1 oz.

No. 2.

Water	3 oz.
Carbonate of potash	1 oz.

Take 2 oz. of No. 1, and add from 1 to 2 drm. of No. 2, or 3 drm. if necessary, to bring out the details; allow from half to three-quarters of an hour's time for the development of one plate, should it be greatly under exposed, and see that the temperature of the solutions is 70° Fah. Density is only obtained by a strong eikonogen solution and length of time of development.

6. The developing and fixing baths must be kept separate. An energetic developer is made by dissolving in warm

Water	40 oz.
Sulphite sodium, c. p.	2 oz.
Eikonogen	1 oz.

To 2 oz. of the above add 1 drm. of following solution:

Water	3 oz.
Carbonate of potash	1 oz.

Begin by soaking the plate in the first solution a few minutes; then, should the plate refuse to develop, add the second. A fixing bath is made by dissolving 1 oz. of hyposulphite of soda in 6 oz. of water.

7. Himly's Eikonogen Developer.—Captain Himly recommends the following:

Water	1,000 parts.
Glycerine	100 parts.
Metabisulphite of potassium	2 parts.
Bisulphite of sodium	75 parts.
Eikonogen	12 parts.
Carbonate of potassium	60 parts.
Yellow prussiate of potassium	40 parts.

8. Hubert's Eikonogen Developer.—

Rain water	300 parts.
Sulphite of soda	50 parts.
Eikonogen	10 parts.

The water should be warm and the salts dissolved in the order given in the formula; then add—

Carbonate of soda	30 parts.

For extremely rapid exposures the undiluted developer is to be used. For shutter exposures of medium rapidity a sufficient quantity of the developer is diluted with half its bulk of water. For time exposures take equal parts of developer and water.—*Le Progres Photographique.*

	Eikonogen.	Sodium Sulphite.	Potassium Carbonate.	Sodium Carbonate.	Potassium Bromide.	Distilled Water.	Glycerine.	Potassium Ferrocyanide.	Sodium Sulphite, grn. to the oz. of solution.	Potassium Carbonate, grn. to the oz. of solution.
	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.		
9. Formula of manufacturers of eikonogen,	1	2	15-16		1-16	45			17 1-5	9 1-7
10. Seed Dry Plate Co.	1	6	1½			60			43 2-3	10¾
11. Cramer Dry Plate Works	1	2⅔	1⅔			53			22	11
12. Eagle Dry Plate Works, for time exposures	1	2	6			128			7	20 31-56
13. Eagle Dry Plate Works, instantaneous exposures	1	2	1			30			29	14½
14. Harvard Dry Plate Works	1	2	2			80			11	11
15. Allen & Rowell Co.	1	4	2			80			22	11
16. Allen & Rowell Co., for instantaneous exposures	1	4	2			40			43 7-10	22
17. Allen & Rowell Co., for bromide paper	1	3	2			128	1		10¼	6 53-64
18. Allen & Rowell Co., for lantern slides	1	5	1	1		128	1	½	17	3⅛
19. Allen & Rowell Co., average for plates, bromide paper, and lantern slides	1	3 1-9	2⅓			74⅓				

20. Development with Separate Solutions.—A. Sulphite of soda, 1½ oz., 30 grn.; eikonogen, 180 grn.; water, 26½ oz. B. Carbonate of soda, 1 oz., 1 drm., 40 grn.; water, 8 oz., 6 drm., 50 min.

Note.—Dissolve the sulphite of soda in the water, and then add the eikonogen. For use employ three parts of No. 1 and 1 part of No. 2. N. B.—Be sure the sulphite is dissolved before adding the eikonogen.

21. Development with Single Solution.—Sulphite of soda, 1½ oz., 30 grn.; carbonate of soda, 1 oz., 1 drm., 40 grn.; eikonogen, 180 grn.; water, 35 oz., 1½ drm.

Note.—Dissolve the sodas in the water, and afterward add the eikonogen. This solution is used direct for developing without the addition of water. The sulphite of soda must be pure and fresh.

22. For very short instantaneous exposures ($\frac{1}{100}$ of a second), and for increasing the power of the developers Nos. 20 and 21, in cases where the plate has not been sufficiently exposed.—

Sulphite soda	5 parts.
Carbonate of potassium	2 parts.
Eikonogen	1 part.
Water	30 parts.

allowed to cool and preserved in a tightly closed stoppered bottle. To prepare this developer, place the chemicals in an earthenware jar, and add the water; stand the jar in a saucepan of boiling water, and bring about dissolution by boiling and stirring.

Preliminary Bath for No. 22.—

Hyposulphite soda	15 grn.
Chloride of mercury solution (1 in 100)	15 min.
Water	55 oz.

Place the plate in this bath for one minute, and develop without rinsing.

23. Messrs. Fradelle and Young's Formula for Portraiture.—A. For normal exposures in the studio: Sulphite of soda, 4 oz.; eikonogen, 1 oz.; distilled water, hot, 100 oz. B. Carbonate of soda, 1 oz.; distilled water, 100 oz.

Notes.—For normal exposures take equal quantities of each, but varied at discretion. For instantaneous work and certain effects of lighting the face, use a stronger solution by reducing the water to 50 oz. in both A and B. Solutions of bromide of potassium and carbonate of soda, 1 in 10, may be kept in reserve for correcting over and under exposure. These are called 10% solutions.

24. Dr. Mitchell's (Photo Soc. of Philadelphia) Formula. — For lantern slides and transparencies.—

A. Sulphite of soda, 1 oz.; eikonogen, ½ oz.; water, 1 pt. B. Carbonate of soda, ¾ oz.; water, 1 pt. (N. B. — The American pint is 16 oz.)

Notes. — For normal exposure take equal parts of A and B and add 2 parts water. For warm tones use half of No. 2 only and give a longer exposure.

25. Formula by Dr. H. G. Piffard (New York Camera Club).—With ammonia addition.—

Sulphite of soda, 2 oz. avoirdupois; eikonogen, 1 oz. avoirdupois; bromide of potassium, 8 grn.; boiling distilled water, 1 qt.

Notes.—Dr. Andresen forbids ammonia with eikonogen; but Dr. Piffard says it can be used as the alkali, and works beautifully; time alone will show. Dr. Piffard's directions are—To 1 oz. of above solution add from 1 to 2 drops of liquid ammonia; but this should be used only in cases of decidedly under exposure. 1 to 1½ drops will do for a properly exposed plate. Instead of ammonia, add, if preferred, from ½ to 1 drm. of an 8% solution of carbonate of potassium, which gives more density than ammonia.

26. Warnerke's Formula.—For Copying Line Drawings and Engravings.—

Sulphite of soda	40 parts.
Eikonogen	20 parts.
Caustic potassium	20 parts.
Distilled boiling water	100 parts.

Use 1 part of developer to 3 of water. Restrain with bromide if necessary. Dissolve the sulphite, then the eikonogen, and lastly the alkali. Filter while still hot, and store away for use. This developer has been used by M. Marcy, in Paris, who is working on physiological subjects requiring extreme rapidity of exposure. He had previously been using hydrokinone, but he found a marked increase in the amount of detail obtained when using eikonogen instead.

27. Formula by Herr Eugen Von Gothard, Herenz Observatory.—For Stellar Photography.—

A. Sulphite of soda, 200 grm.; eikonogen, 50 grm.; water, 3 liters. B. Carbonate of soda, 150 grm.; water, 1 liter.

For use.—Take 3 parts solution A and 1 part solution B.

28. Combined Hydrokinone and Eikonogen Developer.—

Sulphite of soda	300 gr.
Carbonate of soda	200 gr.
Hydrate of soda	30 gr.
Bromide of soda	5 gr.
Hydrokinone	20 gr.
Eikonogen	30 gr.
Water	10 oz.

This developer possesses the rapid action of the eikonogen combined with the sustaining energy of the hydrokinone, and keeps indefinitely. This is the latest phase of a single solution developer, presumably for instantaneous subjects, but I have not yet tried its powers.

29. Dr. Andresen's Fixing Bath. — Plates which have been developed with eikonogen should be well washed, and will greatly benefit by being fixed in the following bath:

Hyposulphite of soda	4 parts.
Bisulphite of soda	1 part.
Water	20 parts.

The advantages of fixing in this bath are that—

a. The negatives have a perfect tone, which enables very fast printing.

b. This new fixing bath remains, even after frequent usage, clear and water white.

30. Eikonogen, 10; potassium caustic, 10; sodium sulphite, 20; water, 100; dilute with 3 to 10 vols. water, according to result required, adding potassium bromide in case of over exposure.—Warnerke, *Phot J.*, xiv., 57.

31. (D.) Eikonogen, 25; sodium sulphite, 50; water, 1,000. (A.) Potassium carbonate, 100; water, 100. (R.) Potassium bromide, 10; water, 100. Mix (D) 3 parts, (A) 1 part, and add small quantity (R) if developer is new.—Cramer, *Phot. T.*, xx., 208-210.

32. (D.) Eikonogen, 1; sodium sulphite, 2; water, to 32. (A.) Potassium carbonate, 1; sodium sulphite, 0·5; water to 64. Mix in equal volumes.—C. A. Dundore, *Phot. T.*, xx., 233, 234.

33. (D.) Eikonogen, 25; sodium sulphite, 50; sodium carbonate crystal, 50; potassium bromide, 0·5; water, 1,000.—C. Jones, *B. J. Phot.*, 1891, 560, 561.

34. (A.) Potassium carbonate, 9; sodium carbonate, 18; sodium sulphite, 120; water, 950. Dilute 100 parts with an equal volume of water, and add eikonogen, 5 parts.—*Phot. A.*, xxxi., 35, 36, from *Amer. A. Phot.*

35. Eikonogen, 50; sodium sulphite, 250; boiled distilled water, 400. (A.) Potassium carbonate, 1; sodium carbonate cryst., 1; boiled distilled water, 10. To 100 parts (D) add 4 parts (A), or more as required.—*A. Phot. B.*, xxi., 69.

36. (D.) Eikonogen, 1 oz.; sodium sulphite, 2 oz.; water, 40 oz.; potassium bromide, 8 grn.

To 1 fl. oz. add not more than 2 drops strong ammonia solution; to get density add 30 to 60 drops of a solution of potassium carbonate (1·8). —H. Piffard.

37. (D.) Eikonogen, 5 to 6; sodium sulphite, 25; water, 500. When dissolved add 20 parts of a mixture of 500 parts of a saturated solution of sodium sulphite with 40 parts hydrochloric acid. (A.) Sodium carbonate, 20; potassium carbonate, 5; water, 500. Mix 3 parts (A) with 10 parts (D).—T. H. Voight, *Phot. A.*, xxxi., 144.

38. Eikonogen Developer for Bromide Paper, by M. V. Portman.—The following is the process I advise for Eastman's bromide paper. (Workers may, of course, try the ferrous oxalate developer recommended in the instruction with this paper, but I admit that after a considerable experience with it, I have a strong objection to it.)

Developer A.—

Eikonogen	2	drm.
Sulphite of soda	4	drm.
Water	8	oz.

To be mixed according to the instructions sent with the eikonogen.

Developer B.—

Carbonate of soda	4	drm.
Water	1½	oz.

Mix just before use. This amount will develop a 15"x12" print. Use fresh developer for each print, and take care, by experiment, that your exposure is correct. Always do your contact printing by a standard artificial light.

After development and washing in water (not under a tap), place the print in a fixing bath of—

Hyposulphite of soda	10	oz.
Sulphite of soda	2	oz.
Water	45	oz.
Sulphuric acid	110	min.

Leave the print in this bath for half an hour; then wash, not under tap, but in a print washer (I always use the Godstone print washer, which answers very well) for half an hour. Then immerse the print for one minute in a tanning bath.

Sulphite of soda	2½	drm.
Water	7½	oz.

Dissolve and add—

Tannin	15	grn.
Hydrochloric acid	1½	drm.

Wash in a Godstone washer for three hours. If after washing the print is muddy in the high lights, immerse it for a short time (sufficient to clear it only) in—

Cyanide of potassium	½	oz.
Water	40	oz.
Iodine	1	grn.

Then wash it again thoroughly.

Formaldehyde.—Formaldehyde, which, with some of its compounds, has been recommended as a constituent of developers, has been further investigated by W. Eschweiler and G. Grossman (*Annalen*, cclviii., 95-110). Formaldehyde sodium bisulphite (sodium oxymethyl sulphonate) is obtained by mixing a strong solution of sodium bisulphite with crude formaldehyde, and adding ethyl alcohol. It forms transparent crystals, easily soluble in water or in methyl alcohol, but only slightly soluble in ethyl alcohol. The crystals have the composition $CH_2O,NaHSO_3,H_2O$, but effloresce and lose water slowly when exposed to dry air. The salt can also be obtained in long, needle shaped crystals containing only half as much water $(CH_2O,NaHSO_3)_2,H_2O$. Formaldehyde-potassium bisulphite is obtained in a similar manner, and forms large tabular crystals, which contain no water of crystallization, and have the composition $CH_2O,KHSO_3$.

Formaldehyde sodium bisulphite, when added to a pyrogallol developer produces variable effects, though in some cases greater detail is obtained with less fog. When used in dilute solution (1 : 1000 or 1 : 2000) as a preliminary bath before ferrous oxalate development, it reduces the time of development, and gives stronger images, with more detail. The plate should be washed, after immersion in the bath, before being placed in the ferrous oxalate, or fog may result.—Eder, *Phot. C.*, xxvii., 105-107.

P. Richter (Phot. Mitt., xxvi., 352) was unable to recognize any advantages arising from the addition of formaldehyde sodium bisulphite to the developer.

Hydrochinon Developers.—These are excellent developers and are excelled only by the eikonogen developer. The word is spelled hydrochinon, hydrochinone, hydrokinone, hydroquinone, quinol, hydro, etc.

1. Water	10	oz.
Sulphite sodium crystals chemical, pure	2	oz.
Hydrochinon	1	oz.

Dissolve in the order named, using, if possible, distilled water. This solution should be kept in a yellow bottle or in a dark place. It will retain its strength for a year or more.

2. Water	10	oz.
Carbonate of potash	2	oz.
Carbonate of soda	1	oz.

The weights are based on 437 grn. to the oz. Put in the graduate 2 drm. of No. 1 and 1½ drm. of No. 2, then fill up to 3 oz. with water. If the developer works too slowly, add 1 drm. additional of No. 2. This will develop several plates in succession. When through, pour the developer into a separate bottle, filtering it through cotton, and preserve for use on future plates, adding a little fresh developer to it.

Make up the following stock solutions: 1. Hydroquinone 8 grn.; distilled water, 8 drm. This must be kept well corked and in a cool, dark place. 2. Carbonate of potash (dry), 12 drm.; distilled water, 3 oz. When quite dissolved filter carefully. This will keep any time. 3. Tartaric acid, 1 drm; distilled water, 30 drm; mythylated spirit (pure), 2 drm. This will keep if well corked. This No. 3 solution is 4 oz. in all, water, acid, and spirit together. To develop a quarter plate, take of these stock solutions: Hydroquinone, 30 minims; add water to make up to 1 oz.; carbonate of potash solution, 2 drm.; water, 6 drm. This makes 2 oz. developer when mixed and should then be poured over the plate, while in the developing dish. Keep the solution moving. The image should appear in from 20 to 30 seconds, and when the detail appears in the shadows add tartaric acid solution, 30 minims. Put this in the developing cup, and pour the developer from the plate into the cup, and return the solution to the dish.

3. Carbonate of soda	4½	oz.
Sulphite of soda	2½	oz.
Hydrochinon	150	grn.
Water	36	oz.

When freshly prepared the bath is too strong and should have a third of water added to it; afterward each time of using a certain quantity of new solution should be added. The solution is not filtered; the clear part is decanted off.

4. Citric acid	5	grn.
Bromide of potassium	10	grn.
Hydrochinon	60	grn.
Sulphite of soda	120	grn.
Water	10	oz.

Grind the hydrochinon in a mortar with warm water, then add the rest and pass it on to the boy to be shaken till thoroughly dissolved; either filter or allow to stand till clear. The alkali to be either caustic soda (4 to 6 grn. per oz.) or common crystals of soda (40 or 50 grn. per oz.), or any chosen mixture of the two. Equal quantities of each for developing.

A.

5. Sulphite of soda .... 2½ oz.
Boiled water.. ... . 16 oz.

B.

Crystal carbonate of soda . ..... ½ lb.
Water (boiled) ....20 oz.

C.

Hydrochinon .... 1 drm.
Rectified 90% alcohol..... 2½ oz.

Take half oz. each of A and B, and add ½ drm. of C.

If over exposure occurs, add to this quantity, say, 2 or 3 drops of—

Bromide of ammonium.....200 gr.
Water..... 2 oz.

For Chloride Plates.—

6. Hydrochinon..... ..... 2 grn.
Sulphite of soda..... 10 grn.
Carbonate of ammonia (or pot)..10 grn.
Bromide of potassium..... $\frac{1}{10}$ grn.
Water..... 1 oz.

A.

7. Hydrochinon. ..... .120 grn.
Sulphite of soda..... 1 oz.
Bromide of potassium.....25 grn.
Water..... .....15 oz.

B.

Dry powdered pure carbonate of potash... ..... 2 oz.
Dry powdered pure carbonate of soda..... 2 oz.
Water to make up to.... .....20 oz.

A and B are mixed in equal parts for development, and the picture is brought out in about three minutes when ordinary bromide plates are used.

8. Carbutt's Hydrochinon Developer.—

A.

Warm distilled water..... ....20 oz.
Sulphite soda crystals ..... 4 oz.
Sulphuric acid..... . 1 drm.
Hydrochinon .....360 grn.
Bromide potassium.....30 grn.
Water to make up to.. .....32 oz.

B.

Carbonate potash. ..... 1 oz.
Caustic soda in stick. .... ½ oz.
Water, to make.....32 oz.

C.

Accelerator.—

Caustic soda..... 1 oz.
Water, to make... .....10 oz.

D.

Restrainer.—

Bromide potassium..... ½ oz.
Water..... 5 oz.

Take of A 1 oz., B 1 oz., water 2 to 4 oz.—the first for instantaneous and short exposures on eclipse and special plates, and the latter for time exposures, portraits and views on our B landscape and ortho. plates. For lantern transparencies, 1 oz. A, 1 oz. B, water, 4 oz.; 15 to 30 drops of a 10% solution bromide potassium. After using, filter into bottle for future use, and for starting development on time exposed plates and films.

9. Hydrochinon Developer. — J. D. Cooper communicates to the *British Journal of Photography* the following formula:

Hydrokinone ..... 6 grn.
Bromide potassium..... 1 grn.
Citric acid. ..... ½ grn.
Sulphite sodium (crystals).....20 grn.
Water..... .. 1 oz.

The sulphite and other ingredients are first dissolved, then the hydrokinone is added.

An alkali solution of carbonate of soda (crystals) is made, 40 grn. of soda to 1 oz. of water.

Equal quantities of the hydrokinone and soda solutions make up the developer for negatives.

The formula is somewhat strong for films rich in silver. If too much density is produced, the right amount may be obtained by dilution, which will adapt the developer perfectly for the production of opals or lantern slides.

10. Hydrochinon Developer (Piffard).—Hydrochinon (Merck's), 50 grn.; carbonate of potash, 150 grn.; sulphite of soda crystals, 200 grn.; water, 10 full oz. Mix and filter. After using it may be returned to the bottle for future use.

11. Hydrochinon—For Lantern Slides.—

A.

Hydrochinon..... .....10 grn.
Sulphite soda crystals, C. P.....60 grn.
Water..... ..... 1 oz.

B.

Carbonate of potash, C.P.....30 grn.
Water..... ..... ½ oz.

Add B to A, and also enough water to make the whole measure two fluid oz., and pour upon the plate.

The development starts rather slower than usual, but when once commenced proceeds with remarkable uniformity.

12. A developer for negatives is made up as follows:

A.

Hydrochinon..... .. 15 grn.
Water..... 1 oz.

B.

Carbonate of soda crystals, C. P., 30 grn.
Water..... 1 oz.

Use equal parts of each, and less of No. 2 in case over exposure is feared. After use the developer may be preserved until as high as forty plates have been developed.

13. Hydrochinon Developer for Lantern Slides.—At a general meeting of the North Middlesex Photographic Club, Mr. Beadle read an interesting paper on slide making, and recommended the following developer:

Hydrochinon. .....160 grn.
Sodium sulphite..... ..... 2 oz.
Nitric acid.....60 grn.
Potassium bromide.... .....30 grn.
Water, to make up to..... ....20 oz.

For the second solution:

Sodium hydrate .....160 grn.
Water... . .....20 oz.

Equal parts of the two solutions form the developer. For use, take equal parts of this solution and water. The picture should come up quickly and perfect in details, with full density in the shadows.—*American Journal of Photography.*

14. Combined Hydroquinone and Eikonogen Developer.—In consideration of the fact that eikonogen, *per se*, tends to give flat negatives, though the energy of the developer is impaired, and that hydroquinone, *per se*, acts rather slowly, giving, however, great density, a combined hydroquinone and eikonogen developer is used and strongly recommended by a well-known amateur photographer. Its composition is the following:

No. 1.

Sulphite of soda cryst..... .....60 grm.
Cryst. soda.....40 grm.
Distilled water.....1,000 c. c.

After solution, to be filtered; keeps any time.

No. 2.

Eikonogen .....50 grm.
Hydrochinon.....50 grm.

Are placed together in a porcelain mortar, rubbed down to fine powder, and then kept

dry for use in a well stoppered glass bottle. For use, take 1 grm. of No. 2 and dissolve it in 100 c. c. of No. 1. The solution keeps well for several weeks. This developer is said to possess all the advantages of the hydroquinone, iron oxalate and pyro developers, without their disadvantages. The greatest advantage, however, consists of the fact that the developer, if larger quantities are to be prepared, is always ready at hand, and that larger or smaller quantities may always be prepared without any delay.—*H. E. Gunther, in Photo. News.*

No. 1.		
15. Soda carbonate	60	grn.
Water	1	oz.
No. 2.		
Hydrochinon	2	grn.
Soda sulphite	60	grn.
Water	1	oz.
For use mix—		
No. 1	1	oz.
No. 2	2	oz.
Water	1	oz.

The above is a modification of a formula given by C. E. Van Sothern, in which he advises the use of 12 grn. hydrochinon to 1 oz. water. It is usually advisable to employ a larger quantity than I have stated when it is found that the gelatine plate used gives a thin image. For line work, negatives and transparencies, the developer may be used over and over again, and then be bottled for use as a starter on another batch of plates. Each successive exposure should be longer when the old developer is used.

16. Hydrochinon Developer for Bromide Prints.—Sodic sulphite, 3 oz.; water, 30 oz.; hydrochinon, 45 grains; sodic carbonate (pure but not dried) 4½ oz.; potassic carbonate, 4½ oz.; potassic bromide, 60 grn. Divide the water into two parts. Dissolve the sodic sulphite, hydrochinon and bromide in one part, and the other ingredients in the other part. Mix the solutions in equal parts for use.

Paramidophenol Developer.—This new developer, introduced by Messrs. Lumiere, has now been tried also by our German authorities, and their judgments are, on the whole, favorable to this reducing agent. Professor Vogel finds that the pure paramidophenol is very insoluble, so that it was impossible to prepare with it the solution recommended by Messrs Lumiere. Dr. Schuchardt, of Gorlitz, has, however, succeeded in producing a hydrochloric preparation of this substance, which, in the hands of Prof. Vogel, proved to be more soluble than the first one, though it is said to dissolve much less readily in cold water than hydroquinone. It is, therefore, necessary to heat the water previously. The developer thus obtained is very energetic, giving, however, somewhat thin negatives, and the mixed solution soon becomes brown. If the paramidophenol solution and the sodium sulphite solution are kept separately, they will keep clear. Also Profs. Eder and E. Valenta state that the paramidophenol forms an excellent developer, giving, according to its composition, every degree of softness or intensity. The color of the negatives is grayish black, the film being free of every bluish or greenish color, even if a neutral fixing bath is used. The authors recommend the use of a dilute solution for the reason that then the paramidophenol does not crystallize out of its solution, and the developer becomes less expensive. Moreover, the diluted solutions form equally excellent developers as the concentrated ones. The formulæ recommended by the authors are the following:

Paramidophenol Soda Developer.—

Water	1,000	c. c.
Sodium sulphite	80	grm.
Carbonate of soda	40	grm.
Paramidophenol	4	grm.

Paramidophenol Potash Developer.—

Water	1,000	c. c.
Sodium sulphite	120	grm.
Carbonate of potash	40	grm.
Paramidophenol	4	grm.

The latter is specially well suited for plates which tend to give thin negatives, while the soda developer yields more delicate images. With the latter, also, transparencies on gelatino bromide emulsion may be developed very successfully.—*H. E. Gunther, in Photo. News.*

Hydroxylamine Developer.—1. Hydroxylamine hydrochlorate, 2 gr.; caustic soda, 3 gr.; potassium bromide, ½ gr.; water, to 1 oz., adding citric acid, 1 grn. or less, if the water used is hard, to prevent the precipitation of lime carbonate (from the carbonate always present in caustic soda) upon the face of the negative. If the citric acid is necessary the bromide of potassium may be omitted, except in cases of over exposure. Hydroxylamine is stated to have a considerable tendency to cause frilling (and therefore must be used dilute) and to be unsuitable for developing plates that have received anything less than a full exposure.

2. Hydroxylamine and Pyro. Developer.—In a paper read before the Photographic Society of Philadelphia, reported in the *American Journal of Photography*, by Dr. Charles L. Mitchell, the following formula is given:

1. Hydroxylamine chloride	30	grn.
Pyrogallol	240	grn.
Water	16	oz.
2. Sodium carbonate (crystals)	1¼	troy oz.
Sodium sulphite (crystals)	4½	troy oz.
Water	16	oz.

To develop, take of No. 1 from 1 to 2 fl. oz.; No. 2, ¼ fl. oz.; water, 4 oz.; flow over the plate, and if the image does not appear within thirty or forty seconds, add more of No. 2 solution in small portions at a time, until development commences.

I have developed a dozen lantern slides, using the same developer for all, and after the last plate was finished, the developer was but of a moderately light orange color. The mixture of the pyro and the hydroxylamine chloride seems to possess remarkable keeping qualities. As a general rule, pyro. mixtures should be stored in yellow or amber colored glass bottles, provided with rubber corks, as the amber color prevents the actinic light from penetrating to the contents of the bottle. The developer is very superior for negatives, giving clear shadows free from stain. Hydroxylamine, though a somewhat new article in photography, can be had from the largest dealers and manufacturers in photographic materials.

Iron Developers.—1. For Cold Tones.—

Potass citrate	136	gr.
Potass oxalate	44	gr.
Hot distilled water	1	oz.
2. For Warm Tones.—		
Citric acid	120	gr.
Ammonia (carbonate)	88	gr.
Cold distilled water	1	oz.
3. For Extra Warm Tones.—		
Citric acid	180	gr.
Ammonia (carbonate)	60	gr.
Cold distilled water	1	oz.

In mixing the solutions Nos. 2 and 3, it is advisable to place the crystals of the salts in a deep vessel, and after adding the water to leave alone till all effervescence ceases. Make overnight. To 3 parts of any of the above formulæ add 1 part of the following at the time of using:

Sulphate of iron	140	gr.
Sulphuric acid	1	drop.
Distilled water	1	oz.

To develop place the exposed plate in a porcelain dish, flood over with sufficient of either of the solutions just mentioned, and keep the dish rocking. The time required to complete

development will vary from one to ten minutes, according to the developer used and the density required. The first formula given is the quickest and the last is the slowest developer.

Ferrous Citro-Oxalate Developer.—

1. Potassium citrate.. ....700 grn.
Potassium oxalate.....200 grn.
Water .. ..3½ oz.

2. Ferrous sulphate.....300 grn.
Water... ....3½ oz.

Mix in equal parts.

3. For black and white tones, develop with ferrous oxalate. The following is the formula:

Oxalate Solution.—

Neutral oxalate of potash.....	1	oz.
Bromide of potassium.....	2½	grn.
Hot distilled water	5	oz.

Iron Solution.—

Pure proto-sulphate of iron	2	drm.
Hot distilled water	2	oz.

To develop, mix together 2 parts of oxalate solution with 1 part of iron solution, and pour in 1 wave across the plate. Rock well during development, which it is advisable to continue as long as detail is visible in the high lights of the picture. Rinse well after development, and previous to fixing. The fixing solution should be of the strength of 1 oz. in 4 oz. of water. The hyposulphite of soda solution should not be mixed till required, as a trace of this salt in the developing bath is ruinous.

4. The following oxalate developer is said to keep well, and was proposed by Mr. Archer Clarke at a regular meeting of the London and Provincial Photographic Association:

No. 1.

Citric acid	1	oz.
Citrate of ammonium.....	1	oz.
Chloride of ammonium.....	1	drm.
Bromide of ammonium.....	1½	drm.
Oxalate of potash.... 10		oz.
Water 50		oz.

No. 2.

Protosulphate of iron.. 3 oz. and 60		grn.
Citric acid.....	1	oz.
Water..... ...50		oz.

Mix in equal proportions.

Pyro (Pyrogallic Acid) Developers.—1. The following formula, given by Captain Abney, in his splendid treatise on photography (of the greatest service to the expert), is an excellent one, giving the very highest results, and is deservedly popular. The solutions here given will have to be made up and kept in tight fitting stoppered bottles:

1. Pyro Solution.

Pyrogallic acid....	50	grn.
Sodium sulphite..... ..150		grn.
Citric acid.....	10	grn.
Water	1	oz.

2. Bromide Solution.

Potassium bromide..... ...	50	grn.
Water.....	1	oz.

3. Ammonia Solution.

Ammonia (0·880).....	2	drm.
Water.....	2½	oz.

These are not exactly 10 per cent. solutions, but for all practical purposes may be regarded as such. Ten drops of No. 1 (pyro solution) will contain 1 grn. of pyrogallic acid; 10 drops of No. 2 (bromide solution) 1 minim of potassium bromide; 10 drops of No. 3 (ammonia solution) 1 minim of pure ammonia.

2. Beach's Potash Developer.—Pyro solution.

Warm distilled water.....	4	fl. oz.
Sulphite of soda (pure).....	4	oz.

When cooled to 70° F., add—

Sulphurous acid (strong)..... ...	3½	fl. oz.
Pyrogallic acid	1	oz.

No. 2.—Potash Solution.—

a. Carbonate potash (chem. pure)..	3	oz.
Water	4	oz.
b. Sulphite soda (chem. pure crystals)	2	oz.
Water.....	4	oz.

Mix *a* and *b* separately, and then combine in one solution.

3. Carbutt's Pyro Developer.—

a. Pyro Stock Solution.

Distilled or ice water..... ...10		oz.
Sulphuric acid	1	dr.
Sulphite of soda, crystals...	4	oz.

Then add Schering's pyro, 1 oz., and water to make 16 fl. oz.

b. Stock Soda Solution.

Water 10		oz.
Soda sulphite crystals.....	2	oz.
Soda carbonate crystals (or dry gran., 1 oz.).....	2	oz.
Potash carbonate.....	1	oz.

Dissolve, and add water to make measure 16 fl. oz.

c. Bromide Solution.

Bromide of sodium or potassium.	½	oz.
Water	5	oz.

For Developer.—

Dilute 1 oz. of stock *b* with 7 oz. of water for cold weather and 10 to 12 oz. of water in summer. To 3 oz. of dilute *b* add 1½ to 2½ drm. of *a*. The more pyro the denser the negative, and *vice versa*. No yellowing or fogging need be apprehended if our directions are followed. Development should be continued until the image seems almost buried, then wash and clear.

4. Cramer's Pyro Developer.—Prepare the following solutions:

a. Alkaline Solution.

	Engl. Meas. Troy Wght.	Metric Wghts. and Meas.
Water.....64	oz.	1,250 c. c.
Carbonate of sodium crystals (sal soda).....	2½ oz.	50 grm.
Sulphite of sodium crystals	3 oz.	60 grm.

This will produce negatives of a warm tone. If the sulphite is increased to 6 oz. the negatives will be of a gray or black tone. The alkaline solution must be kept in well stoppered bottles. If the negatives show yellow stain, make a fresh solution and try another lot of sulphite crystals.

b. Pyro Solution.

Distilled or pure ice water	6 oz.	300 c.c.
Oxalic acid.....	10 grn.	1 grm.
Sulphite of sodium crystals.....	1 drm.	6 grm.
Pyrogallic acid....	1 oz.	50 grm.

All pyro solutions work best while fresh. Eight grains dry pyro may be substituted for 1 drm. of this solution.

c. Bromide Solution.

Water.....10	oz.	300 c. c.
Bromide of potassium....	1 oz.	30 grm.

For Use.—

Alkaline solution	8 oz.	250 c. c.
Pyro solution.....	2½ drm.	10 c. c.

When the developer is quite new the addition of—

Bromide solution .....10 to 40 min. 1 to 3 c. c. is necessary to make it work perfectly clear.

Keep the developer moderately warm in winter, cool in summer.

Bromide solution produces intensity, contrast and clearness. It should be added when developer is strong in alkali and new, also when developer is warm, when plates are over exposed, or when the plates develop without

Table Showing comparative Value of Alkaline Carbonates in Developers.

O. G. MASON, M.D.

Commercial Name.	Chemical Symbol.	Molecular Weight.	The Commercial Salt contains of the pure Salt about	100 parts of 36 per cent. Acetic Acid Require for Saturation	Solubility in Water (approximate).
Soda, Caustic	NaHO	40	80 to 92 %	26·66 parts of 90 % Soda	1 part in 2
Sodium Carbonate Carbonate of Soda Sal Soda, Crystals	$Na_2CO_3, 10H_2O$	286	96 to 98 %	89·38 „ 96 % „	1 „ 2
The same, anhydrous or in dry powder	Na_2CO_3	106	About 98 to 99 %	89·38 of 98 to 99 % dry Sal. Soda.	1 „ 6
Sodium Bicarbonate Bicarbonate of Soda " Sesqui-carbonate of Soda "	$NaHCO_3$	84	98 to 100 %	50·91 of 99 % Bicarb. Soda.	1 „ 12

Equal work is done by 80 parts of Caustic Soda, 286 parts of Sal Soda (crystals), 106 parts of Sal Soda (dry), 168 parts of Bicarbonate of Soda. These quantities must be increased to make up for any impurity contained in the sample being used; for this purpose the usual percentage of impurity given in the above table may be assumed for all ordinary photographic uses.

Potassa (Caustic Potash)	KHO	56	80 to 95 %	37·33 parts of 90 % Potassa.	1 part in 1
Potassium Carbonate Carbonate of Potassa Sal Tartar Saleratus	$K_2CO_3, 1\frac{1}{2}H_2O$	165	76 to 96 % Usually about 81 %	51·11 parts of 81 % Carb. Potassa	1 „ 1
Potassium Carbonate, dry	K_2CO_3	140	About 95 %	122·74 parts of 95 % Carb. Potassa.	1 „ 1
Potassium Bicarbonate Bicarbonate of Potassa	$KHCO_3$	100	100 %	60 parts of 100 % Bicarb. Potassa.	1 „ 4

Equal work is done by 112 parts Caustic Potassa, 165 parts (about) Carbonate Potassa, 200 parts of Bicarbonate Potassa. These quantities must be increased in proportion to impurities, as noted in case of Soda. These two alkalies are interchangeable for doing the same amount of work when *pure*, and when the one named in a given formula cannot be obtained, the table may assist in choosing a substitute of proper strength and solubility.

Dry or anhydrous Carbonate of Potassium is not usually found in the market.

sufficient strength and brilliancy. Use Cramer's clearing solution.

In compounding developers, carbonate of potassium or of sodium in different forms may be used to answer the same purpose, if proper attention is paid to their relative strength.

Twelve parts carbonate of sodium crystals (commonly termed sal soda or washing soda) are equivalent to 5 parts carbonate of sodium, dried, or 6 parts carbonate of potassium.

The sulphite of sodium is added to prevent rapid decomposition of the pyro or eikonogen. Too much sulphite in the developer renders its action slower.

5. Cramer's One Solution Developer.—Stock Solution.—

Sulphite of soda, crystals.....	3 troy oz.
Bromide of ammonium.....	½ troy oz.
Bromide of potassium.....	1½ troy oz.
Pyrogallic acid.....	2 troy oz.
Dissolve thoroughly in distilled water.....	32 fl. oz.
Add sulphuric acid, c. p...	20 min.
Finally strongest aqua ammonia	3 fl. oz.
And water to make up bulk to.	40 fl. oz.

acid, 120 gr.; bromide ammonium, 40 gr.; pyrogallic acid, 2 oz. 2. Water, 24 fl. oz.; sulphite of soda crystals, 4 oz.; carbonate of potash, 6 oz. To develop a 5x7 plate, take water 4 oz.; No. 1, 2 dr.; No. 2, 2 dr. If more intensity is required, use more of both No. 1 and No. 2. More of No. 1 will restrain, more of No. 2 accelerate.

8. Hoover Potash Developer.—A. Water, 12 fl. oz.; crystals sodium sulphite, 2 oz.; citric acid, 60 grn.; bromide ammonium, 20 grn.; pyrogallic acid, 1 oz.

B. Water, 12 fl. oz.; crystals sodium sulphite, 2 oz.; potassium carbonate, 3 oz. Mix A and B in equal parts and use one drachm of the mixture to each ounce of water.

Tintypes, Developer for.—Messrs. Spiller & Crook, after long experience, give the following as a good developer for ferrotype plates:

Water	1 oz.
Sulphate iron...	14 grn.
Saltpeter.....	10 grn.
Acetic acid, No. 8.....	30 min.
Nitric acid.....	2 min.

Some have added—

Sulphate of potash.....	10 grn.

Ackland's Table for the Simplification of Emulsion Calculations.

	Equivalent Weights.	Weight of $AgNO_3$ required to Convert One Grain of Soluble Haloid.	Weight of Soluble Haloid required to Convert 1 Grain $AgNO_3$.	Weight of Silver Haloid produced by One Grain of Soluble Haloid.	Weight of Soluble Haloid required to produce 1 Grain of Silver Haloid.	Weight of Silver Haloid produced from One Grain $AgNO_3$
Ammonium bromide	98	1·734	·576	1·918	521	
Potassium ,,	119 1	1 447	·700	1·578	·633	
Sodium ,,	103	1·650	·606	1·825	548	1·106
Cadmium ,, com.	172	·988	1·012	1·093	·915	
,, ,, anh...	136	1 25	·800	1·382	·723	
Zinc ,,	112 1	1 509	·663	1·670	660	
Ammonium chloride	53 5	3 177	315	2·632	·373	·844
Sodium ,,	58 5	2 906	·344	2 453	·408	
Ammonium iodide	145	1 172	·853	1 670	·617	
Potassium ,,	166·1	1·023	·977	1·415	·707	1·382
Sodium ,,	159	1 133	882	1·566	·638	
Cadmium	183	·929	1·076	1·284	·778	

Measure the sulphuric acid and the aqua ammonia very exactly, and keep the latter in a cool place.

For use dilute as follows: For normal exposures, 1 oz. to 11 oz. water. For instantaneous exposures, use 1 oz. with 3 or 6 oz. water. For overexposed plates, 1 to 20 oz. Fix in alum and hypo. bath.

6. The pyro. and carbonate of soda developer will give softness. Dissolve in—

Water	6 oz.
Sodium sulphite	2 dr.
Sodium carbonate	2 dr.

and just before using add—

Dry pyrogallic acid	3 gr.

Should the density be too weak, put in twice the quantity of pyro. The softness is regulated by the quantity of pyro. No bromide is necessary.

7 Hoover's Potash Developer.—1. Water, 24 fl. oz.; sulphite of soda crystals, 4 oz.; citric

A potassium collodion should be used. The tones which this developer give are of a metallic luster, resembling the daguerreotype.

The Dusting on Process.—1. Saturated solution bichromate of ammonia, 10 drm.; honey, 6 drm.; albumen, 6 drm.; distilled water, 40 to 60 drm.

2. Dextrine, 1 oz.; grape sugar, 1 oz.; bichromate, 1 oz.; water, 1 pt.

Eikonogen. See *Developers.*

Enameling Photo. Prints.—Use very clean plates and rather larger than the prints to be enameled. Wipe them well, rub them with talc, and remove the excess with a soft brush passed lightly over the surface. In a dish, half filled with ordinary water, immerse the photographs and allow them to soak. This being done, coat one of the talcked plates with enameling collodion in the ordinary way, agitate to cause the ether to evaporate, and when the film has set—that is to say, in a few seconds—steep this plate, the collodionized surface up,

Prof. Burton's Table of Comparative Exposures.

Apertures Calculated on the Standard System of the Photographic Society	Sea and Sky.	Open Landscape	Landscape with Heavy Foliage in Foreground.	Under Trees, up to		Fairly Lighted Interiors		Badly Lighted Interiors up to		Portraits in Bright Diffused Light out of doors.	Portraits in Good Studio Light.		Portraits in Ordinary Room.	
				mins.	secs.	mins.	secs.	hrs.	mins.		mins.	secs.	mins.	secs.
No. 1, or f/4.....	1/100 sec.	1/50 sec.	1/25 sec.	0	10	0	10	0	2	1/6 sec.	0	1	0	4
No. 2, or f/5·657.....	1/50 sec.	1/25 sec.	1/12 sec.	0	20	0	20	0	4	1/3 sec.	0	2	0	8
No. 4, or f/8.....	1/25 sec.	1/12 sec.	1/6 sec.	0	40	0	40	0	8	2/3 sec.	0	4	0	16
No. 8, or f/11·314 ...	1/12 sec.	1/6 sec.	1/3 sec.	1	20	1	20	0	16	1 1/3 sec.	0	8	0	32
No. 16, or f/16	1/25 sec.	1/12 sec.	2/3 sec.	2	40	2	40	0	32	2 2/3 secs.	0	16	1	4
No. 32, or f/22·627.....	1/12 sec.	1/6 sec.	1 1/3 sec.	5	20	5	20	1	4	5 1/3 secs.	0	32	2	8
No. 64, or f/32.....	1/6 sec.	1/3 sec.	2 2/3 secs.	10	40	10	40	2	8	10 2/3 secs.	1	4	4	16
No. 128, or f/45·255	1/3 sec.	2/3 sec.	5 1/3 secs.	21	20	21	20	4	16	21 secs.	2	8	8	32
No. 256, or f/64	1 2/3 sec.	1 1/3 sec.	10 2/3 secs.	42	40	42	40	8	32	42 secs.	4	16	17	4

in a second dish containing pure water. Now take one of the prints in the first dish and apply the printed side to the collodion, remove the plate from the dish, keeping the print in its place with the finger of the left hand, and remove the air bubbles by lightly rubbing the back of the photograph with the forefinger of the right hand. Care has been taken beforehand to prepare some very pure starch paste, passed through a cloth, and some thin cardboards, or simply thick paper, the size of the plates used. The air bubbles having completely disappeared, and the perfect adherence of the print ascertained, dry with bibulous paper, and spread over the prepared cardboard on paper a coating of the collodion by means of a flat brush. Apply this sheet on the print, pass the finger over it to obtain complete adherence, and give it twenty-four hours to dry. At the expiration of this time, cut with a penknife the cardboard or paper even with the print, and detach by one corner. If the plate has been well cleaned, the print will come off itself. We get in this manner a very brilliant surface, and as solid as that obtained by the use of gelatine, which, as it is seen, is entirely done away with in this process. The prints are afterward mounted on thick cardboard in the usual way. It is possible, by mixing with the collodion some methyl blue dissolved in alcohol (a few drops are sufficient), to obtain moonlight effects, especially if a rather strong negative has been used. For sunsets, make use of an alcoholic solution in coccinine.—*F. Tarniquet, in Science en Famille.*

Encaustic Paste.—

1. Pure wax..... .....500 parts.
   Gum elemi..... 10 parts.
   Benzole..... .....200 parts.
   Essence of lavender..... .... 300 parts.
   Oil of spike... .. .. 15 parts.

2. A *glacé* appearance may be given to prints by rubbing over the surface lightly with clean flannel the encaustic paste made by dissolving in 200 grm. of benzole the following ingredients:

   Gum elemi... .... 10 grm.
   Essence of lavender ... .300 grm.
   Oil of spike ..... 15 grm.

Filter and add—

   Pure virgin wax.....500 grm.

The whole should be set on a water bath, which will aid in dissolving the wax. To make the paste thinner add more of the essence of lavender.

3. Dr. Eder's Cerate (Encaustic) Paste.—White wax (pure), 100 grn.; dammar varnish, 40 drops; *oil of turpentine*, 100 drops.

4. Salomon's.—Pure virgin wax, 250 parts; gum elemi, 5 parts; benzole, 100 parts; essence of lavender, 150 parts; oil of spike, 7½ parts.

5. Best white wax (cut in shreds), 2 oz.; turpentine, 10 fl. oz. Dissolve with moderate heat. If too hard, add a small quantity of turpentine.

Faded Photographs, to Restore.—The following method is simple and in most cases quite effective: Put the card in warm water until the paper print may be removed from the card backing without injury. Hang up the paper in a warm place until perfectly dry, and then immerse it in a quantity of melted white wax. As soon as it has become thoroughly impregnated with the wax it is pressed under a hot iron to remove excess of the latter, and rubbed with a tuft of cotton. This operation deepens the contrasts of the picture and brings out many minor details previously invisible, the yellowish whites being rendered more transparent, while the half tones and shadows retain their brown opaque character. The picture thus prepared may then be used in preparing a negative which may be employed for printing in the usual way.

Faded prints can be restored by means of the following solutions: A. Sodium tungstate, 100 parts; water, 5,000 parts. B. Precipitated chalk, 4 parts; bleaching powder (chloride of lime), 1 part; sodium aurochloride, 4 parts; distilled water, 400 parts. Solution B is made in a well corked yellow glass bottle, is allowed to stand twenty-four hours, and is then filtered into another yellow bottle. The faded prints are well washed, and placed in a mixture of 1 to 2 parts of B and 40 parts of A. When the intensification is sufficient, the prints are immersed in a solution of 1 part of hypo in 10 parts of solution A until all yellowness has disappeared, and are then well washed.—(H. Laudaurek, *A. Phot. B.*, xxi., 420).

Failures.—Foggy Negatives.—Caused by overexposure; white light entering camera or dark room; too much light during development; decomposed pyro., introduction of hypo. or nitrate of silver into the developing solution, from the fingers or from tablets used for wet plates; developer too warm or containing too much carbonate of soda or potassium.

Weak Negatives with Clear Shadows.—Under development.

Too Strong with Clear Shadows.—Under exposure.

Weak Negative with plenty of Detail in the Shadows.—Want of intensity, caused by over exposure. Shorter exposure with longer development will in most cases produce sufficient intensity, and an addition of more pyro. stock solution to the developer will seldom be necessary.

Fine Transparant Lines.—Using too stiff a brush in dusting off plates.

Transparent Spots.—Dust on plate or air bubbles while developing.

Crystallizations on the Negative and Fading of Image.—Imperfect elimination of the hypo.

Yellow colored negatives are caused by not using enough sulphite of sodium in developer, or if the article used is old and decomposed.

Yellow stains are caused by using old hypo. bath which has assumed a dark color, or by not leaving plate in hypo. bath long enough.

Mottled appearance of negative is caused by precipitation from fixing bath containing alum, if the solution becomes old or if it is turbid.

Films, to Strip.—M. Izard recommends the following plan of stripping photographic films from glass. Make a solution of rubber in benzol, and coat your negative with it; when dry, apply a film of collodion, yet another of rubber, and finally, another of collodion. A narrow strip of black paper is then cemented to the margin of the plate all round, and this, when the film is dry and is stripped with a penknife, makes a suitable frame.

Fixing Baths.—Carbutt's New Acid Fixing and Clearing Bath.—

1. Hyposulphite of soda.....16 oz.
   Sulphite of soda..... 2 oz.
   Sulphuric acid .... 1 drm.
   Chrome alum . ... ½ oz.
   Warm water ....64 oz.

Dissolve the sulphite of soda in 8 oz. of the water. Mix the sulphuric acid with 2 oz. of the water, and add slowly to the solution of soda sulphite; dissolve the chrome alum in 8 oz. of the water, the hyposulphite soda in the remainder, then add the sulphite solution, and last the chrome alum. This fixing bath will not discolor until after long usage, and both clears up the shadows of the negative and hardens the film at the same time.

Let remain two or three minutes after negative is cleared of all appearance of silver bromide. Then wash in running water for not less than half an hour to free from any trace of hypo. solution. Swab the surface with wad of wet cotton, rinse, and place in rack to dry spontaneously.

2. Cramer's Fixing Bath.—After developing

and rinsing, the negatives may be fixed in a plain hypo. bath, 1 part hyposulphite of soda to 4 parts of water, but the following formula is especially recommended:

	Engl. Meas., Troy Wght.	Metric Wghts. and Meas.
Water	1 qt.	1 liter.
Sulphite of sodium crystals	4 oz.	120 grm.
After being dissolved add—		
Sulphuric acid	½ oz.	15 c. c.
Chrome alum, powdered.	3 oz.	90 grm.
Dissolve and pour this into a solution of—		
Hyposulphite of soda	2 lb.	1 kilo.
Water	3 qt.	3 liters.

This bath combines the following advantages: It remains clear after frequent use; it does not discolor the negatives and forms no precipitate upon them. It also hardens the gelatine to such a degree that the negatives can be washed in warm water, provided they have been left in the bath a sufficient time. The plate should be allowed to remain in the bath five to ten minutes after the bromide of silver appears to have been dissolved. The permanency of the negative and freedom from stain as well as the hardening of the film depends upon this.

3.—Fixing Bath —

Hyposulphite of soda	500 grm.
Water	4 liters.

4.—Hot Weather Bath.—

Hyposulphite of soda	1 kilo.
Powdered alum	1 kilo.
Bicarbonate of soda	250 grm.
Water	8 liters.

Flash Light Powder to Burn.—A square metallic spirit lamp, having a flat top, is fitted with two wicks, one in front of the other, and separated by two or three inches. Immediately behind this lamp is a short wide-mouthed bottle containing magnesium in powder. Dipping into this powder is a glass tube, the other end being carried up through the cork and bent toward the flames of the spirit lamp, which are in a line with the direction of the blowpipe. A second short piece of tube is passed through the cork, its outer end being connected with the rubber tube of a pneumatic ball. On giving this ball a quick, sharp squeeze, a small quantity of the powder is suddenly ejected from the blowpipe nozzle against the flames, this being attended by a dazzling flash. This is capable of being repeated as long as any of the magnesium powder remains in the bottle.—*Br. Jour. of Photography.*

Flash Light Powders.—1. Magnesium powder, 6 oz.; potassium chlorate, 12 oz.; antimony sulphide, 2 oz.; 75 to 150 grn. of the powder should be used. 2. 15 grn. of gun cotton and 30 grn. of magnesium powder are used.

3. Magnesium ..... 40%.
Permanganate of potassium .... 40%.
Peroxide of barium ..... 20%.

4. Purchase 1 oz. of magnesium powder and 1 oz. of negative gun cotton from dealers in photographic materials. Place on a dust pan enough cotton, when pulled out, to measure about 3½ in. in diameter. Sprinkle it over with 20 grn. of magnesium powder to form a thin, even film. Lay over the magnesium thus arranged a very thin layer of gun cotton. Connect to the bunch of cotton a small fuse of twisted cotton about 6 in. long, so that it will extend to the side of the dust pan. Then set the pan on a step ladder near the object, and when ready, light the gun cotton fuse with a match, when instantly a brilliant flash will ensue. There are several ready prepared magnesium compounds now sold with special devices and lamps to fire them.

To Find the Focus of a Lens.—The focus of a lens, *i. e.*, the distance it is from the ground glass when the object to be photographed is in correct focus, differs with the distance at which the object photographed is from the camera. The focus, however, for the purpose of definition, is what is known as the equivalent focus, and is taken as that distance at which an object at a considerable distance off is found to be in focus. The simplest way to find the equivalent focus of a lens is to point the lens and camera at the sun, and focus the image of the latter on the ground glass. The distance, then, between the ground glass and the lens, if a single one, or between the ground glass and the diaphragm aperture, will be the equivalent focus of the lens. There are more exact and mathematical methods than this, but it will be found to be practically all that is desired except for purely scientific purposes.

Formaldehyde. See *Developers.*

Frilling.—1. The following formula of Captain Abney's is, in most cases, a sure remedy against frilling:

Tough pyroxyline	6 grn.
Alcohol (0 820)	½ oz.
Ether (0·75)	½ oz.

Apply this to the film before development; the solvents must then be washed away in a dish of clean water. When all repellent action is gone, apply the developing solution.

2. No 1. Gallic acid, 1 part; alcohol, 10 parts. No. 2. Silver nitrate, 1 part; water, 16 parts; acetic acid, ½ part. Mix 1 part No. 1 with 4 parts water and add a few drops No. 2.

Frost Pictures on the Window.—The beautiful fairyland like forms which frost often takes on the window panes of a cold morning form a splendid and attractive subject for camera work. They are best taken when the light falls on them sideways, and not full from the front. Set the camera dead square with the window, and behind the window pane and a foot from it put a board covered with black velvet or other dark non-actinic material. Use a slow plate, stop down until the utmost sharpness is obtained, and give an exposure of three or four seconds, calculated at *f*/16. Of course in most cases to secure these pictures, the photographer must be up early.

Glazing Gelatine Prints.—The use of highly hand-polished sheet vulcanite rubber for imparting a high gloss to the surface of gelatino-bromide prints is now well known, but, in consequence of the difficulty in obtaining good samples, and of its high cost, the general use of it has been somewhat limited. A substitute, in the shape of ferrotype plates, costing but a mere fraction of the rubber, has been recently tried with success. Upon the smooth, varnished side of the sheet is laid the moist print, film side down. It is then squeegeed by passing a rubber roller over the back, which presses out all the air bells. In an hour or so the print, when dry, can be pulled off at one corner, and will possess a high gloss. A slight heat applied on the rough side of the metal sheet will materially hasten the drying.—*Scientific American.*

Glacé Prints.—Apply the prints face down while wet to the smooth varnished side of a ferrotype plate, squeezing it by rolling a rubber roller over the back, having blotting paper between the print and paper. When dry, it will have a high polish and drop off the sheet. The polish is called glacé finish. To mount such prints without losing the gloss, make the following mounting solution: Soak 1 oz. refined gelatine in cold water for an hour, then drain off and squeeze out the water as much as possible; put the gelatine in a jelly pot and place the latter in a pan of hot water on the fire; when the gelatine has melted, stir in slowly ½ oz. pure alcohol, and bottle for use. This glue will keep indefinitely, and can be melted for use in a few minutes by standing the bottle in a basin of hot water. As it contains a very small percentage of water, it hardly affects the gloss of the prints and dries almost immediately.

Glass Substitute, Orange.—Mr. J. B. Huffman, of Chillicothe, Mo., sends the following substitute for orange glass for dark room work to the St. Louis *Photographer*. It is simple and easily tried:

Asphaltum	3 parts.
Spirits of turpentine	1 part.

Coat the glass plate from one to four times, as desired, flowing the same as if it were collodion.

Photographic Dark Room Windows.—The following formula has been recommended as a stain for dark room windows:

Water	100 c. c.
Gelatine	5 grm.
Nitrate of silver	1 grm.

Glass coated with this solution is exposed to light until it assumes a reddish brown tint. It is then washed to eliminate the nitrate of silver. A surface is thus obtained through which the actinic rays do not pass. The coloration may be deepened by increasing the proportion of nitrate of silver up to 3 or even 4 grm. Glass tinted in this way may also be used to shade the dark room lantern.

Gold, Chloride of.—Dr. John H. Janeway, an amateur photographer, suggests the following method: Dissolve a $2.50 gold piece in 6 drm. of chemically pure muriatic acid, 3 drm. chemically pure nitric acid, and 3 drm. distilled water. Put the gold in a large graduate, pour on the acids and water, cover the graduate with a piece of glass to shut off or retard the escape of fumes, and set in the sun or in a warm place. When the gold is dissolved add bicarbonate of soda very gradually, stirring with a glass rod at each addition, until effervescence has ceased and the froth subsided, and the carbonate of copper which has been formed is deposited as a green precipitate. Now add 6 oz. of water, and let the whole settle for not over thirty minutes, and then very carefully filter the solution. To the clear golden liquid which has passed through the filter add carefully enough nitric acid, chemically pure, to turn blue litmus paper decidedly red, then add enough pure water to make the solution measure 32 fl. oz. The solution will keep for any length of time, and 1 oz. will tone 4 sheets of paper.—From *Philadelphia Photographer*.

Halation and its Prevention.—Halation is the term given to the halo which often surrounds windows in photographs of interiors, and blocks up the details. It is, too, often found to occur in landscapes taken in a strong light, the tops of trees and other objects which are surrounded by strong light being lost in a mist, or entirely obliterated. It is caused by reflection from the back of the plate, and occurs most strikingly in plates of the cheap class, which are thinly coated. With very thickly-coated plates it rarely occurs, except when taking brightly-lighted interiors. To prevent it the back of the plate may be coated with a mixture of powdered burnt sienna, ½ oz.; gum arabic, ½ oz.; glycerine, 1 oz.; water, 5 oz. This is readily washed off before development. A special ready-made preparation is sold for this purpose by Tylar, if preferred. Another way is to cut dead black needle paper, or black American cloth, to the size of the plate, coat it with glycerine and squeegee it on to the back of the plate when placing it in the slide.

1. Cornu (*Compt. Rend., B. S. F. Phot.*) has discussed the phenomena of halation, and points out that in order to prevent halation entirely the varnish or pigment put on the back of the plate must have the same refractive index as glass. Such a pigment is obtained by mixing lampblack with certain essential oils, a mixture of oil of cloves and oil of cinnamon answering very well.

2. Debenham (*Phot. J.*) has investigated the relative efficiency of various substances when applied as a backing to plates with a view to prevent halation, and finds that very good results are obtained with a mixture of gelatine and burnt sugar, or gum, burnt sugar, and Chinese ink.

3. J. Pike (*B. J. Phot. A.*) backs plates with a mixture of matt varnish and collodion deeply stained with rosaniline. The collodion he makes by dissolving 1 oz. pyroxylin in 12 oz. methylated spirit and 36 oz. methylated ether of sp. gr. 0·735.

4. Mr. W. E. Debenham (*Jnl. of Photo. Soc. N. S.*, xiv.) has devised an apparatus for estimating the efficiency of plate backings. He employs a paraffine lamp behind an optical lantern condenser, and a graduated screen in front of it, reflecting the light into the camera lens by a right-angled prism, on the reflecting surface of which the material to be tested is placed. He has tested a considerable number of substances, and the following list enumerates them in the order of their efficiency, and gives occasional explanatory remarks:

a. No backing.
b. Two parts of lampblack with 1 part of bitumen. Optical contact very poor when dry.
c. Carbon tissue squeegeed on after soaking it in a mixture of equal parts of glycerine and water. Practically impossible to get optical contact.
d. Burnt sienna laid on with a sponge.
e. A benzine solution of bitumen applied thickly.
f. A commercial dead black.
g. Gum and burnt sienna.
h. Gelatine, burnt sugar and China ink.
i. Gelatine and burnt sugar.
j. Gum, burnt sugar and China ink.

It seems that with backing *e* the exposure must be increased about 240 times to get an effect equal to that when no backing is applied. The last three give practically equal results, and are very strikingly superior to the bitumen *e*. Mr. Chapman Jones (*Photography*) holds that under theoretically perfect conditions the whole of the photographically active light that impinges upon a sensitive plate would be retained in the film, and be available for the production of the image on development, and that the film ought to be, and practically can be, so opaque that backing the plate is unnecessary in landscape work and portraiture. Some Continental savants have given much attention to the subject of halation, but they do not appear to have added anything to our knowledge of the matter.

Hydrochinon. See *Developers*.
Hydroxylamine. See *Developers*.

Hypo., to Remove.—1. Hydroxyl.

Peroxide of hydrogen (20 vol.)	1 drm.
Water	5 oz.

After washing the negative well it is immersed for a couple of minutes in the solution and again rinsed in water, when the intensification with silver can be at once proceeded with.

2. Where peroxide of hydrogen is not obtainable the following may be used as a substitute, the solution containing that substance in combination with others:

Barium dioxide	1 oz.
Glacial acetic acid	1 oz.
Water	4 oz.

Reduce the barium dioxide to a fine powder and add it gradually to the acid and water, shaking until dissolved. A few minutes' immersion in this solution will effectually remove or destroy the last traces of hypo.

Hypo., Test for.—A simple test to tell when the hypo. is eliminated is to add to the washing water in which the prints are immersed a small quantity of an alcoholic solution of iodine. This will change the white back of each print to a light blue color, which proves that hypo. is still present in the paper. The prints are continued to be washed until the blue disappears from the back of the print.

We then know that the hypo. is completely eliminated.

Ink for Writing on Photographs.—The following answers very well for numbering and marking proofs, the writing being executed on a dark portion:

Iodide of potassium	10 parts.
Water	30 parts.
Iodine	1 part.
Gum	1 part.

The lines soon bleach under the strokes by the conversion of the silver into iodide.

Ink, Printing Process.—By means of gelatino-bromide of silver emulsions, rapid printing paper can be successfully made, but its manufacture is attended with considerable bother; and as it will keep well it is advisable for the beginner to purchase it ready prepared from dealers in photographic materials. One method of preparing the paper is, first, to make a sensitive emulsion as given by Henderson on page 293 of the November 8, 1884, issue of the *Scientific American*, and then to coat a sheet of plain Saxe paper with it, by laying the moistened sheet upon a level plate of glass, and bending the edges up by strips of wood, to form a paper dish. The emulsion while warm is now poured on the center of the sheet until a pool is formed large enough to permit it to be spread equally over the sheet by a glass rod. It is then allowed to cool, and when sufficiently set the sheet of paper is hung up to dry. It may now be exposed, film side away from the face of the thick cardboard drawing, in an ordinary printing frame for two or three seconds to diffused daylight, or for a minute and a half to the light from a large kerosene lamp. The image is then developed by immersing the exposed sheet in a solution of ferrous oxalate of potash composed of saturated solution of neutral oxalate potash acidified with a solution of oxalic acid sufficient to turn blue litmus paper red, 6 oz. saturated solution of sulphate of iron, 1 oz. The iron must be poured into the oxalate. Half a dozen exposed sheets may be developed one after the other, in the same solution. The sheet is next washed by soaking in a pan of water for four or five minutes, removed and immersed in a solution of—

Hyposulphite soda	1 oz.
Water	6 oz.

for eight minutes, which fixes the print; the latter must now be washed for two or three hours in several changes of cold water, when it may be hung up to dry, which it must do spontaneously, as the application of heat will melt the gelatine film. Examination of the print will show the lines and figures non-reversed as in the original drawing, because the sensitive sheet was laid on film side away from the drawing. The operation of preparing and developing the paper must be carried on in a dark room lighted only by a deep ruby red non-actinic lamp.

A. *Intensification.*—With correct exposure and development, intensification need never be resorted to. The following formula is, however, very effective.

1. Bichlor. mercury, 240 grn.; chloride ammonia, 240 grn.; distilled water, 20 oz.

2. Chloride ammonia, 480 grn.; water, 20 oz.

3. Sulphite of soda (crys.) 1 oz.; water, 9 oz.

Let the plate to be intensified wash for at least half an hour; then lay in alum solution for ten minutes and again wash thoroughly; this is to insure the perfect elimination of the hypo. The least trace of yellowness after intensifying shows that the washing was not sufficient.

Flow sufficient of No. 1 over the negative to cover it, and allow to either partially or entirely whiten; the longer it is allowed to act the more intense will be the result; pour off into the sink, then flow over No. 2, and allow to act one minute; wash off and pour over or immerse in No. 3 until changed entirely to a dark brown or black. No. 3 can be returned to its bottle, but Nos. 1 and 2 had better be thrown away. Wash thoroughly and dry.

B. In the following paragraphs various methods of intensifying gelatino-bromide plates are arranged according to the amount of density producible by their means.

1. Almost Imperceptible Increase of Density.—The negative is soaked for a minute in water, then dried rapidly by taking off the surface moisture with a soft cloth or blotting paper, after which the plate is placed in a horizontal position and exposed to a current of warm, dry air, until it is quite dry.

2. Perceptible Increase of Density.—The wet negative is wiped back and front with a cloth, then immersed for a few minutes in a bath of methylated spirits; when taken out it is drained for a few seconds, wiped again with a dry cloth and held before the fire or over a gas flame, keeping it at a safe distance at first and in a horizontal position.

3. Slight Increase of Density.—The plate, after being washed from the hypo., is immersed in a saturated solution of bichloride of mercury in water. It should remain in this bath until it becomes white; if it refuses to bleach, it is probable that the hyposulphite has not all been removed. The bleached plate is rinsed for about 3seconds—not more—in water, so as to remove the surplus mercury solution from the surface, then it is at once dipped into a bath consisting of a semi-saturated solution of sulphite of soda. This second bath will slowly turn the plate black, and will also, as a consequence of the insufficient washing, cover the surface of the film with a dense white deposit, which cannot be rubbed off; but this deposit will very quickly dissolve away in the final washing and leave the image perfect. The density will remain the same if the plate is dried slowly, but will be increased by drying quickly, according to No. 2.

4. Moderate Increase of Density.—The plate is treated precisely as in No. 3, except that a thorough washing is given between the bichloride of mercury and the sulphite of soda baths. This gives additional density. No white deposit will be produced, but a good final washing should be given. Extra density may also be produced by quick drying.

When the image is of a deep yellow or non-actinic color, such as is sometimes produced with pyro. development, the use of this intensifier, No. 4, will alter the color to a neutral gray of about equal printing value. If it should then prove to be too dense, the plate can be immersed for a few minutes in the hypo. bath. This will take away the extra density, and leave a gray image equal in depth to the original yellow one, but of course much quicker for printing purposes.

5. A Vigorous Intensifier.—The plate, or rather the film upon it, is bleached in a saturated solution of mercury bichloride in water, washed, dried; then, when dry, immersed in a semi-saturated solution of sulphite of soda, washed again and dried. The only difference between this process and No. 4 is in the drying of the plate between the mercury and sulphite of soda baths. This drying causes a decided increase of density.

6. A Powerful Intensifier.—This, the well-known ammonia process, is about equal in strength to the preceding. The plate is bleached as before and washed thoroughly. If the washing is too short, stains will be produced which cannot be removed. After washing, the wet plate is immersed in very weak ammonia (water, 20 parts; ammonia, 1 part). The plate instantly turns black. A fair amount of washing should then be given to secure permanence and freedom from stains. Dry slowly, if the density is sufficient.

7. In addition to the above, we recommend

Monckhoven's cyanide of silver intensifier, made as follows:

No. 1.

Bichloride of mercury	120 grn.
Bromide of potassium	60 grn.
Water	12½ oz.

No. 2.

Cyanide of potassium crystals (pure)	120 grn.
A. Water	6¼ oz.
B. Nitrate of silver	120 grn.
Water	6¼ oz.

Pour A into B, which forms cyanide of silver. A slight excess of silver will settle at the bottom of the bottle, which assists in keeping the solution up to its full strength and does no harm.

The plate should be left in No. 1 until the film appears white on the back. It is then thoroughly washed and immersed in No. 2, or the solution may be poured on quickly. Immediately the film will commence to blacken, and the plate should be kept in until there appears to be no white color on the back. If left too long, the cyanide will commence to reduce the negative.

This intensifier acts rapidly and imparts to the film a bluish black color. It is an excellent intensifier for lantern slides, imparting a desirable warm purple color.

8. To Cure Over Intensification.—There is a very simple method of reducing negatives which have been intensified by mercury solutions. It is simply to leave them in the fixing bath for a longer or shorter period, according to the amount of reduction desired. If left for half an hour, the whole of the extra density imparted by the intensifying process will be removed, and the plate will then be in its original condition. The hypo. should of course be finally freed from the film by a copious washing.

9. Cramer's Intensifying Solution.—Prepare a saturated solution of bichloride of mercury in water, and of this pour a sufficient quantity gradually into a solution of—

	Engl. Meas. Troy Wght.	Metric Wghts. and Meas.
Iodide of potassium.	1¼ oz.	50 grm.
Water	6 oz.	250 c. c.

until the point is reached when the forming red precipitate will no longer dissolve by shaking, but be careful not to add more mercury than just enough to make the solution very slightly turbid. Now add—

Hyposulphite of soda	1 oz.	40 grm.
Dissolve and fill up with water to make total solution	20 oz.	800 c. c.

For use this should be diluted with about 3 parts of water. If the plate has not been thoroughly fixed, the intensifying solution will produce yellow stains. Be careful not to overdo the intensifying. Should it have gone too far, the negative can be reduced by placing it in the fixing bath for a short time.

10. Intensifying Solution.—Saturated solution bichloride mercury.—

Iodide potassium	40 grm.
Water	180 c. c.
Hypo	30 grm.
Water to make up to	600 c. c.

11. Lead Intensifier.—Lead nitrate, 20 grn.; ferricyanide of potassium, 30 grn.; distilled water, 1 oz., and filter. Follow, after very thorough washing, with ammonium sulphide in 10 times its bulk of water. The washing before the ammonium sulphide should be continued until the drainings from the plate give a scarcely perceptible blue color, with ferrous sulphate solution, that is, until the ferricyanide is quite washed out, for the least trace of lead remaining will surely cause fog.

12. Uranium Intensifier.—Uranium nitrate, 4 grn. to 1 oz. of water. After soaking the plate in this, mix the liquid with a dilute solution of potassium ferricyanide made by running water over a few crystals to wash them, and then shaking them with a drachm or two of water a few seconds. Add more ferricyanide as necessary.

13. Intensification with Cupric Bromide.—Prepare cupric bromide solution by mixing a solution of 1 part potassium bromide in 25 parts water with a solution of 1 part cupric sulphate in 25 parts water, allow to settle, and filter or decant off the clear liquid. Wash the negative until free from hypo. and immerse in the cupric bromide solution, which will convert it into a brilliant white positive. Wash well and immerse in strong ammonia solution diluted with 12 parts of water. This intensifier gives increased contrasts.—S. R. Bottone, *Y. B. Phot.* 1891, 115, 116.

Lantern Plates, a Use for Spoiled.—The best thing to do when lantern plates have been spoiled by over exposure or errors in development, or by the light getting at them, is to strip the films from them, and use them as cover glasses for binding up the completed slides.

Leaf Photographs.—Pass the paper first through a solution of gelatin, 1 part in 20 parts of hot water, and use a strong solution of potassium bichromate; or the gelatin and bichromate may be used together. Wash with hot water. A strong blue background may be produced as follows: Dissolve in 2 oz. of pure water 120 grn. of red prussiate of potash (potassium ferrocyanide), and separately 140 grn. double citrate of iron and ammonium in 2 oz. of water; mix the solutions, filter, float the paper for a few minutes on the filtrate; print from the dried paper as before, and wash thoroughly in water. By adding a little phosphoric acid to the bichromate solution and exposing the print before washing to the vapor of a hot solution of aniline in alcohol, a blackish-green or red positive is obtained. Or, prepare the paper with solution of iron sesquichloride, and develop after exposure with a very dilute solution of silver nitrate. Use plain photographic paper.

Light, the Safest for Dark Room Use.—Bear in mind that very rapid plates are sensitive to light of any color. The safest light is a combination of a ruby and yellow, just strong enough to enable you to judge of intensity of negative and progress of development, and the plate should not be held close to the light for examination for more than a few seconds.

The following combinations make a safe light:

Orange colored paper with ruby glass.
Orange glass with cherry fabric.
Ruby glass with canary fabric.
Orange and ruby glass combined with ground glass.

Green is not as non-actinic as ruby and yellow combined, and it has furthermore the disadvantage that with it the intensity of negative cannot be judged so well as with the ruby light.

To make sure your light is safe, make the following test:

Cover one half of a lightning plate with opaque paper and expose it to the light for about two minutes at the distance generally observed while developing. Develop, and if the unprotected part of plate shows fog, screen the light with additional paper or fabric until it is found perfectly safe.

Lightning, Photographing of.—A very interesting study is lightning photography. It is a puzzling one to the beginner, yet it is, perhaps, the simplest form of photography which can be imagined. If the photographer has had much experience, he will doubtless know the point at which his camera requires to be racked out to insure the lens being in proper focus

for a distant object. If this is so, he need have no further trouble than, when night comes on and the lightning commences to play, to rack out his camera to this point, fix it up, and direct it toward that portion of the sky from which the lightning appears, then place the dark slide in the back, and draw the slide, remove the cap, and wait for the flash. It being night, no harm can come to the plate by reason of this exposure during the interval of waiting. The lightning will impress itself upon the plate without any need of shutter or other contrivance. If the point at which the camera is in focus is at a distance which is not known, there will probably be a lamp somewhere or other within sight, and in this case a rough focus can be obtained upon that.

Linen or Other Fabric, Photographing on.—For decorating table napkins, bed room trimmings, etc., the following simple process works satisfactorily, and photographers may often do much extra business by introducing it to their customers.

Boil the fabric in water containg a little soda, so as to remove the dressing, iron smooth, and saturate with—

Ammonium chloride....	2 grammes. (about 31 grains).
Water	250 cubic cents. (about 9 ounces).
White of two eggs.	

The above are well beaten together, allowed to subside, and strained. When dry, sensitize on the usual silver bath—rather a strong bath is to be preferred—expose, tone, and fix as for an ordinary print on albumen paper.—*Photo. Review.*

Machinery, Photographing of.—A color for coating machinery previous to photographing:

Dry white lead...	5	lb.
Lampblack. ..... 2 to	5	oz.
Gold size.....	1	pt.
Turpentine.....	1½	pt.

The amount of lampblack is varied to suit machine or lighting. This paint is easily removed with turpentine.

Matt Surface on Silver Prints.—Mount the print in the ordinary way, avoiding lumps. Roll, and afterward sift on the surface finely ground pumice powder. With a circular motion rub gently with the palm of the hand. Proceed until the surface desired is obtained. The use of plain paper is recommeneed.

Moonlight Effects.—The so-called moonlight effect is a photographic deception. To secure this effect select a view with the sun almost in front of the camera, but itself hidden or partly obscured by clouds, and preferably a day when the sky is full and well defined, and well broken up with cloud masses. Then expose about the usual time for the view in question, and develop with a developer containing only ¼ grn. of pyro. to the oz., until the details are just out. Wash off the developer, and apply a fresh one, 4 grn. of pyro. and 4 grn. of bromide to the oz., until the high lights have attained the requisite density. Another method, which frequently gives good results, is, still with the sun in front and preferably shining strongly, to give a very short shutter exposure, and develop strongly. This gives brilliant lighting, and dense masses of shadow.

Mounting Prints.—For a large collection of receipts for mounting photographs, see **Pastes.**

Prints, to Mount on Glass.—To mount prints on glass, follow the directions given by J. E. Dumont; that is, take 4 oz. gelatine and soak half an hour in cold water, then place in a glass jar, adding 16 oz. of water; put the jar in a large dish of warm water and dissolve the gelatine. When dissolved, pour into a shallow tray. Have your prints rolled on a roller, albumen side out; take the print by the corners and pass rapidly through the gelatine, taking great care to avoid air bubbles. Hang up with clips to dry; when dry, squeeze carefully on to the glass. The better the quality of glass the finer the effect.

Gelatine Mountant.—

Gelatine.....	4 oz.
Water	16 oz.
Glycerine.....	1 oz.
Alcohol, 90%.....	5 oz.

Negatives.—Method for Quickly Drying Gelatine Negatives.—After the final washing, place the plate in a bath of methylated spirit for four or five minutes. On taking it out flow two or three times with common methylated sulphuric ether. After this the negative will dry in a current of air in two or three minutes.

To Take Gelatine off Disused Negatives.—Place in a hot bath, in which previously a good dose of washing soda and soap has been dissolved.

To Remove Varnish from a Negative.—Warm (cautiously) the negative before a fire or over a spirit lamp; then pour a little methylated spirit upon it, and with a tuft of cotton wool gently rub the face of the negative; drain and repeat. Then cover with the spirits, drain and let dry.

To Prevent Negatives from Frilling.—Soak the plates before development in a saturated solution of Epsom salts. Then wash, and develop as usual; or use water containing a little Epsom salts, ½ oz. or more to a pail of water.

To Fill Cracks in a Varnished Negative.—Procure some finely powdered lampblack and gently rub with a circular motion all over the negative, using the finger or a soft piece of wash leather for the purpose. This will cause all the cracks to disappear.

To Print from Cracked Negative.—Place the printing frame at the bottom of a narrow box, at least 2 ft. deep, and with blackened sides; over the negative in the frame put a sheet of thin tissue paper. Another way: Suspend from a roasting jack a board upon which a printing frame can rest, the roasting jack being in motion all the time of printing. Or, in the case of a slight crack, move the frame about in the hands briskly during the process of printing.

Paper.—Preparation of paper with arrowroot (Monkhoven).—Water, 150 parts; chloride sodium, 3 parts; citrate sodium, 3 parts; arrowroot, 3 parts. Stir the arrowroot flour and thoroughly mix in some cold water; then pour while constantly stirring into the boiling water. Coat the paper with the starch mixture by means of a brush. It should not be floated on the silver bath longer than one-half to one minute. Fuming in the ammonia box eight minutes makes the prints more intense and brilliant.

Ashman's Durable Paper.—After the paper is sensitized, float it back downward for five minutes on the following solution: Water, 50 parts; gum arabic, 1½ parts: hydrochloric acid, 1 part; citric acid, 1 part; tartaric acid, 1 part. Dry as quickly as possible after removal.

Preparation of Paper with Gelatine (Abney).—Water, 240 parts; chloride of ammonium, 3 to 4 parts; gelatine, ½ part; citrate of sodium, 5 parts; chloride of sodium, 1 to 1½ parts.

Albumenized Paper, to Give a Matt Surface to Prints on.—Mount the print in the ordinary way, but be careful to avoid any lumps. Well roll, and then sift on finely-ground pumice powder. Rub gently with palm of the hand, using circular motion. Examine from time to time. Continue operation until the proper surface is obtained.

Albumen Paper, Sensitizing Bath for Albumenized Paper.—35 to 60 grn. of silver nitrate to the oz. of water: add enough carbonate of soda to cause slight turbidity, and filter.

Durable Sensitized Paper.—Float the albu-

menized paper on a 10 per cent. solution of nitrate of silver for four minutes, draw it over the glass rod to drain, and then float the back of the sheet for a like period upon a bath composed of—

Citrate of potash	1 part.
Water	30 parts.

Finally wash in rain water.

Debenham's Method.—Sensitize by the usual nitrate solution, with the addition of 10 drops of perchloric acid to each oz. of the sensitizing bath.

Albumen Paper, Preservative Book for Sensitized Paper.—Soak thick blotting paper in a saturated solution of bicarbonate of soda, and when this is dry make a book of it. Keep the sensitive paper between the leaves of this book, the sheets being kept in pairs, face to face.

Fuming.—This is the process of subjecting ready sensitized paper to the fumes of ammonia. Hang the sheets separated in a box and place a saucer of ammonia in the bottom and allow the vapor to act for fifteen minutes. Ready sensitized paper is giving way to the Omega, Aristotype and other papers.

Paper Negatives.—At a regular meeting of the London and Provincial Photographic Association Mr. W. Turner gave the following as his method of making paper negatives: The picture or drawing to be copied is made translucent by means of lard diluted with turpentine—one part of lard to three parts of turpentine. The mixture was then boiled for three minutes, which he claimed killed the grease, and it was then rubbed over the drawing. When surface dry the drawing was placed in a printing frame with sensitized silver paper, and a negative made, which was fixed in an old hypo. bath rich in silver, and washed in the usual way.

The plain paper was prepared by floating Saxe paper on the following:

Sodium chloride.....	200	grn.
Gelatine	30	grn.
Water	20	oz.

Dissolve the gelatine and chloride separately and mix; float three minutes. When dry, sensitize by floating one or two minutes on the following:

Silver nitrate	1	oz.
Citric acid.....	1	drm.
Water	14	oz.

He stated that the paper would keep good for six weeks.

Pastes for Mounting. See **Pastes.**

Photo-Chromos.—Allow the photograph to remain in water until thoroughly soaked; then place it between blotting paper, and let it remain until just damp enough to be pliable. Then coat the face of the picture with good starch paste and lay face down on the glass. Commence in the center of the picture and rub outward toward the edges, to dispel all air and excess of paste, care being observed not to get paste on the back of the print. While rubbing, keep the paper damp with a sponge. When dry, lay on a heavy coat of castor oil, and after a time, rub off the excess of oil with a cloth. After standing a day or two, it may be colored. Cover the back with a thin plate of glass and bind the edges.

Photographing. See *Clouds*, *Frost*, *Lightning*, *Moonlight*, *Snow*, *Sun*, etc.

Pinholes, to Prevent.—Pinholes, or minute transparent spots on the negative, are most frequently caused by the presence of minute particles of dust on the film, which, during exposure, prevent the light getting to the film at those particular spots. To prevent pinholes, therefore, steps must be taken to guard against dust. The plates should be wiped over before being placed in the slide with a camel hair brush, or, better still, with a piece of velvet stretched on a stick. The slide itself should also be dusted out first, while both it and the interior of the camera bellows should be rubbed lightly over with glycerine, to which any dust which may be flying about will stick in preference to the plate. The slides, too, should be carried in a case which is fairly dust proof.

Primuline Process.—Primuline, a product of the action of sulphur on paratoluidine, discovered by A. G. Green, dyes cotton, linen, and similar fabrics without a mordant even better than it does wool or silk. The color fades somewhat rapidly when exposed to light, but the primuline itself is not sufficiently sensitive to be available for photographic purposes. If the primuline is treated with dilute nitrous acid, it forms diazoprimuline, which has the power of forming a variety of coloring matters by combination with various phenols and amines. Diazoprimuline in contact with vegetable and animal fibers is very sensitive to light, and upon exposure is decomposed, and loses its power of forming coloring matters. If, therefore, a fabric or surface dyed with primuline and converted into diazoprimuline is exposed to light behind a transparency or anything similar, and is afterward treated with a phenol or amine, an image is obtained, the color of which depends upon the nature of the developer, but which is positive from a positive, negative from a negative.

The material (cotton, linen, silk, wool, paper, wood, gelatine, celluloid, xyloidine, etc.) is dyed in a hot solution of primuline, washed, and diazotized by immersion in dilute solution (0·25 per cent.) of sodium nitrite acidified with hydrochloric or some other acid. It is again washed and allowed to dry spontaneously in the dark. The sensitized material, which will keep for some time, is exposed to daylight or the electric light, the time of exposure being determined by means of some unprotected strips of the same material, which are exposed alongside the printing frame. As soon as these strips cease to give any color when touched with a drop of the particular developer that is going to be used, decomposition is complete in the high lights of the object that is being copied. The sensitive material is removed from the frame, and at once, or after some time, is developed by immersion in a dilute (about 0·25 per cent.) solution of a phenol or amine; *e g.*, for red, an alkaline solution of β napththol; for maroon, an alkaline solution of β napthol disulphonic acid; for yellow, an alkaline solution of phenol; for orange, an alkaline solution of resorcinol; for brown, a slightly alkaline solution of pyrogallol, or a solution of phenylene diamine hydrochloride; for purple, a solution of α napththylamine hydrochloride; for blue, a slightly acid solution of eikonogen. If a design in different colors is desired, the different developers may be applied with a brush. After development, which requires two or three minutes, the prints are washed in water for a short time; in the case of the blue and purple developers the final washing must be done in a very weak solution of tartaric acid. Wool and silk require a longer time in exposure and development than does cotton or linen, and the maroon and blue developers are not suitable for wool or silk. In all the applications primuline may be replaced by its homologues; for silk dehydrothiotoluidine sulphonic acid may be used. Among the possible uses of the process may be mentioned the reproduction on linen of architects' drawings, etc. A. G. Green, C. F. Cross, and E. J. Bevan, *Eng. Pat.* No. 7,453, May 13, 1890, *J. C. S. I.*, ix., 1001-1004. *Phot N.*, xxxiv., 701, 702, 707, 708.

The Brit. Jour. Phot., xxxvii., 657, 658, recommends the following proportions for primuline developers: Red, β naphthol, 40 grn.; caustic soda or potash, 60 grn.; water, 10 oz. Orange, resorcinol, 30 grn.; water, 10 oz.; caustic potash or soda, 50 grn. Purple, naphthylamine, 60 grn.; hydrochloric acid, 60 minims; water, 10 oz. The following developers are also recom-

mended: Ink, black, eikonogen, 60 grn.; water, 10 oz. Brown tones, pyro., 50 grn.; water, 10 oz.

After washing in plain water the ground is cleared by washing in soap and water. If the transparency printed from is not dense enough to allow complete decomposition in the high lights, the results are improved by exposing the whole of the back of the print to light for a short time.

Printing Processes.—The blue process has been treated under blue paper, but an additional formula is given here as well as formulas, for blue, violet, red, and green prints.

Blue Prints.—Float the paper until it lies quite flat upon a solution prepared as follows:

1. Water	2	fl. oz.
Red prussiate of potash	120	gr.
2. Water	2	oz.
Ammonia citrate of iron	140	gr.

When these two are dissolved, mix them together and filter into a clean bottle.

The solution should not be exposed to a strong light, and the paper must be floated on it in a very subdued light, and in the same manner as paper is floated on a silver solution. When it no longer curls, but lies flat on the solution, take it by the corners and raise it slowly from contact, and hang it up to dry in a dark place. When dry, it can be used at once, or may be kept for future use by rolling it, prepared surface in, and placing it in a tin box or other receptacle, free from light and dampness.

To make a print on this paper, place the prepared surface in contact with the negative in a printing frame and expose to sunlight.

The time of exposure will vary according to the density of the negative and the intensity of the light. The rule is to allow the light to act long enough for the portions which first turn blue to become gray, with a slight metallic luster. At this point remove the paper from the frame and place it in a dish of clean water.

It now gradually becomes a rich blue throughout, except the parts which should remain white. Change the water from time to time, until there remains no discoloration in the whites; dry, and the picture requires no further treatment.

The blue color may be totally removed at any time by placing the print in ammonia water.

This is the standard formula.

Another Process for Blue Prints.—Float the paper for a minute in a solution of—

Ferricyanide of potash	1	oz.
Water	5	oz.

Dry it in a dark room, and then expose beneath a negative until the dark shades have assumed a deep blue color, then immerse the print in a solution of—

Water	2	oz.
Bichloride mercury	1	grn.

Wash the print, and then immerse it in a hot solution of—

Oxalic acid	4	drm.
Water	4	oz.

Wash again and dry.

Another Process—the Cyanotype.—Float the paper on a solution of the sesquichloride of iron. Dry and expose, afterward wash the prints, and then immerse them in a bath of ferricyanide of potash. The picture will appear of a blue color in all those places where the sun has acted.

Process with Salts of Uranium.—The paper, without having undergone any preceding preparation, except that of having been excluded from the light for several days, is floated on a bath of the nitrate of uranium as follows:

Nitrate of uranium	2	drm.
Distilled water	10	drm.

The paper is left on the bath for four or five minutes, it is then removed, hung up, and dried in the dark room. So prepared, it can be kept for a considerable time.

The exposure beneath a negative varies from one minute to several minutes in the rays of the sun, and from a quarter of an hour to an hour in diffused light. The image which is thus produced is not very distinct, but comes out in strong contrast when developed as follows:

Nitrate of Silver Developer.—

Distilled or rain water	2	drm.
Nitrate of silver	7	grn.
Acetic acid	a mere trace.	

The development is very rapid in this solution. In about half a minute it is complete. As soon as the picture appears in perfect contrast, the print is taken out and fixed by immersion in water, in which it is thoroughly washed.

Chloride of Gold Developer.—This is a more rapid developer than the preceding. The print is fixed in like manner by water, in which it must be well washed, and afterward dried. When dried by artificial heat, the vigor of the print is increased. Prints that have been developed by the solution of nitrate of silver may be immersed in the gold bath, which improves their tone.

The picture may be developed, also, by immersing the prints in a saturated solution of bichloride of mercury and afterward in one of nitrate of silver. In this case, however, the times of exposure must be increased.

Pictures may be obtained, also, by floating the papers on a mixture of equal quantities of nitrate of silver and nitrate of uranium in about six times their weight of water.

When dry, they are exposed beneath a negative. In this case the image appears, as in the positive printing process, with chloride of silver, being effected by the decomposition of the nitrate of uranium, which, reacting on the nitrate of silver, decomposes this salt and reduces the silver. These prints require fixing in the ordinary bath of hyposulphite of soda, and then washing, as usual.

Process for Red Pictures.—Float the papers for four minutes in the preceding bath of nitrate of uranium, drain, and dry. Next expose beneath a negative for eight or ten minutes, then wash, and immerse in a bath of—

Ferricyanide of potash	30	grn.
Water	3	oz.

In a few minutes the picture will appear of a red color, which is fixed by washing thoroughly in water.

Process for Green Pictures.—Immerse the red picture, before it is dry, in a solution of—

Sesquichloride of iron	30	grn.
Distilled water	3	oz.

The tone will soon change to green; fix in water, wash, and dry before the fire.

Process for Violet Pictures.—Float the paper for three or four minutes on a bath of—

Water	2	oz.
Nitrate of uranium	2	drm.
Chloride of gold	2	grn.

Afterward take them out and dry. An exposure of ten or fifteen minutes will cause the necessary reduction; the picture has a beautiful violet color consisting of metallic gold. Wash and dry.—*Estabrooke.*

Prints.—Trimming Prints.—There is more art in print trimming than at first meets the eye. It is not sufficient merely to cut off the edges evenly, so as to include everything there was on the plate, or to place a cutting shape upon it and trim it round. There are two main considerations in print trimming. First, that the sides of the print are cut true with the horizontal or vertical lines of the picture. If your picture is a sea view, cut the top and bottom of the print parallel with the horizon line. If you

have no horizon line to go by, take the side of a house, or anything else in the picture, which must of necessity be vertical. Use this as your guide, and cut the sides of your picture parallel with it. Of course in both cases the other two sides will be square with the first two treated. Secondly, trim your print down, if it can be improved thereby. In the majority of cases the appearance of a picture will be improved by cutting off a little of the foreground, reducing the amount of sky by half an inch or more, or cutting off more or less of either or both ends. Get four pieces of white cardboard and cover up different portions of your print and see whether you cannot improve its appearance by excision of superfluous parts.

Washing Prints.—No care can be too great to insure the thorough washing of photographic prints, especially silver prints. If it is possible they should be washed in running water, in such a washer as Wood's or Jeffery's patent. In these washers a steady current of water is caused, which has the effect of constantly turning the prints over and over, and exposing them at all points to its washing action, while the surplus is removed by means of a siphon, or other arrangement from the bottom. Hypo, which has to be removed from the prints entirely, or fading will result, is heavier than water, and consequently sinks to the bottom, being taken off with the outflow of the surplus water. Mere soaking is not sufficient, but if a constant flow of water, such as that suggested, or a proper apparatus cannot be obtained, one of the best methods of removing the fixing agent will be to soak the prints alternately in hot and cold baths, allowing them to remain, say, five minutes in each and giving them at least half a dozen changes from one to the other. This method of washing, however, is not suitable for bromide prints, the gelatine surface of which would be destroyed by hot water.

Titles on Prints.—To print the name on the photograph, several methods may be adopted. The simplest is to write the title of the subject on a slip of paper with aniline copying ink, or with ordinary copying ink mixed with gamboge or vermilion. Then slightly dampen the surface of the negative near the bottom right or left hand corner in as unobtrusive and unimportant a portion of the picture as possible. Press down the paper with the writing upon it. Leave for a few minutes and then remove the paper, when the writing will be found to have adhered to the negative. When printed, the name will print out white. Another way is to write backward on the negative, while another and better plan is to write the name in Indian ink on the surface of the paper before it is printed on. The ink will wash off in the after operations and leave the name in white where the surface of the paper has been protected by the ink.

Proofs, to Preserve.—Dip the proof in a solution of hyposulphite of soda, 20 gr., dissolved in 5 oz. of water for ten minutes, then wash in changing water for two hours.

Red Pictures. See *Photo Printing Processes.*

Retouching Powder.—This powder is prepared by mixing together—

Dextrine	2 parts.
Resin (very finely powdered)	1 part.

It may be employed both for application to negatives and to albumenized prints. A leather stump is the best means of application.

Sensitizing Paper.—For Blue Prints. 1. Red prussiate of potash, 5 parts; water, 50 parts.

2. Ferric oxalate of potassium, 5 parts; water, 50 parts. Mix the two solutions in the dark, and coat the paper with the mixture by means of a sponge. See also *Blue Prints.*

Monkhoven's Sensitizing Solution.—Nitrate of silver, 6 parts; nitrate of magnesia, 6 parts; distilled water, 50 parts. Each time, after sensitizing a sheet in this solution, 1 drm. of a one-to-eight solution of nitrate of silver should be added to the bath for every 100 square inches of paper sensitized.

Sensitizing Solution for Paper.—

Nitrate of silver	5	drm.
Distilled water	5	oz.
Nitric acid	2	drops.
Kaolin	1	oz.

Silk, Photo. Printing on.—1. In the *Photographische Mitarbeiter* the following recipe for preparing silk for printing from is given:

No. 1.

Tannin	40	grm.
Water	1,000	c. c.

No. 2.

Salt	40	grm.
Arrowroot	40	grm.
Acetic acid	150	c. c.
Water	1,000	c. c.

No. 1 is mixed with No. 2, well shaken, and filtered. The older the mixture, the better it is for use. In this bath the silk is thoroughly immersed, and allowed to remain for three minutes, when it is taken out and hung up to dry.

Sensitizing solution is composed of a silver one to ten, acidified with nitric acid.

Toning Bath.—

No. 1.

Chloride of gold	1 grm.
Water	200 c. c.

No. 2.

Sulphocyanide of ammonium	20 grm.
Water	500 c. c.

No. 1, after shaking, is mixed with No. 2. In a few days the mixture will become clear, when it is ready for use. It is preferable to dilute with from two to four times the quantity of water. Fixing and washing as usual.

2. To print on silk prepare the following solution:

Boiling water	20 oz.
Chloride of ammonium	100 grs.
Iceland moss	60 grs.

When nearly cold, filter and immerse the silk for fifteen minutes. Sensitize for fifteen minutes in an acid 20 grn. to oz. silver bath, and when dry stretch the fabric over cardboard. Print deeper than usual and tone in—

Water	20 oz.
Acetate of soda	2 drm.
Chloride of gold	3 grn.

Common whiting, a few grn. Fix in hypo. 1 to 20.

To Photograph on Silk.—Immerse the silk in—

Water	1 oz.
Gelatine	5 grn.
Chloride of sodium	5 grn.

Hang it up to dry; then float for half a minute on a 50-grain solution of nitrate of silver; dry, print, tone and fix, as usual.

Silver Baths, to Renovate. See *Baths, Silver.*

Silver Nitrate, to Make.—To make nitrate of silver out of pure silver, place the silver in a beaker and pour into it three quarters of a fluid oz. of strong nitric acid sp. gr. 1·4 for every oz. of metal. The beaker is heated till the whole of the silver dissolves. The solution is then poured into an evaporating basin, and the excess of acid driven off by boiling. The operations should be conducted in the open air. The salts left may be recrystallized by dissolving in the smallest possible quantity of boiling water and allowing it to cool. The crystals of pure nitrate of silver will gradually form. The salt remaining in the mother liquor can be recovered by evaporation. To prepare chloride of

gold the copper in the coin must first be eliminated. The gold coin is put into a beaker, and a mixture of three parts of hydrochloric acid and one of nitric acid is poured into it and heat applied until the metal is dissolved. The excess of acid is then expelled by evaporation. The impure gold chloride, when free from acid, is dissolved in boiling water, and a cold saturated solution of protosulphate of iron added, till a dark precipitate of pure gold is no longer produced. The precipitate of gold must be poured on a filter and washed by pouring boiling water constantly over it, till the wash water no longer produces a precipitate with a solution of barium chloride, proving that the gold is free from the excess of sulphate of iron. The gold is again dissolved in nitro-hydrochloric acid, the solution evaporated to dryness, the latter part of the operation being carried on slowly to prevent spurting. The yellow crystalline chloride of gold thus prepared should be preserved in a well stoppered bottle or a sealed tube, as the salt is very deliquescent.

Snow Scenes, Exposure for.—After the photographer has been working during the bright days of summer, and has probably put away his camera for a month or two, he naturally goes for it when the snow comes down, but the exposure will be found to be very puzzling. He knows that the light in winter—perhaps he has made a few experiments—is very dead, and that four or five times the exposure of his summer pictures is the rule. So he starts away and gets poor results. The rough and ready rule for photographing snow scenes is to give them the same exposure as would be given to the same view in summer. Really, what one has to do to get the finest effect is to photograph the snow, and leave the uncovered patches to take care of themselves. Snow being white, reflects a great deal of light, and therefore the exposure must be very short.

Sun, the Position of.—Do not expose when the sun is either directly in front of the camera or directly behind it. If directly in front, if the whole plate escapes being fogged by the sun shining into the lens, the result will be an almost entire absence of detail in the shadows, and a flat and uninteresting picture. On the other hand, if the sun is right behind the camera, no shadows will be seen, or rather only the brightly lighted sides of every object will be seen by the lens, and a flat picture, lacking in contrast, will result. If these two extremes are avoided, pictures may be taken in almost any other direction with advantage, the shadows serving to create contrast, and give rotundity and life to the picture.

Beware of the Sun.—When the sun is brilliantly shining, be careful to keep your slides from its direct rays. A capital plan is to have what is known as a poacher's pocket made in the inside of your coat, large enough to carry a couple of dark slides. They can be carried here right up to the moment of placing them in the camera, and should be slipped from the pocket into a fold of the focusing cloth. This should also be spread right over the camera, dark slide and all, while exposure is being made. If these precautions are taken, there will be very little to fear from the light getting through the slides, unless they leak very badly. If there are any cracks or crannies whatever in the dark slide, the direct rays of a powerful sun will find them out.

Tin Types, Formulas for Making.—The plate is coated with a collodion made as follows, but it can be bought at photo. dealers ready made:

1. Collodion.—Alcohol and ether, equal parts; gun cotton sufficient to make moderately thick film, say 5 or 6 grn. to the oz.; put the cotton in the ether first, when it is well saturated pour in the alcohol, to which add:

Iodide of ammonium	4 grn. to the oz.
Iodide of cadmium	2 grn. to the oz.
Bromide of cadmium	1 grn. to the oz.
Bromide of copper	1 grn. to the oz.

There are 8 grn. of salt to the oz. When the collodion has set, the plate is immersed in a silver bath, made by dissolving 50 grn. of nitrate of silver in 1 oz. of distilled water, and kept there from two to five minutes. It is then put into a plate holder, exposed for twenty-nine seconds in the camera, and developed with the following:

2. Developer.—

Water	64 oz.
Protosulphate of iron	4 oz.
Acetic acid	4 oz.
Alcoholic solution of tannin, 10 grn. to the oz.	4 oz.

The acid and tannin solutions should be added after iron has been dissolved. The developer has to be flowed over the plate with one sweep. The picture is fixed by putting the plate into—

Cyanide of potassium	2 oz.
Water	64 oz.

Then washed and dried.

Toning Baths.—The treatment of the prints is sometimes followed by passing them into a dilute solution of sodium acetate or ordinary common salt, about 1 per cent., such as here shown, and stirring them about for five minutes, when it will be seen they have assumed a brick red color, the object of which is threefold: First, the fibers become charged with a substance which acts as a chlorine absorbent, a necessary property to be mentioned further on. Secondly, a definite color is insured to start with, thus obviating the possibility of mistaking fresh prints in the toning bath for those which have become purple by reason of the deposited gold, an important consideration when dealing with fumed paper. Thirdly, the last trace of free nitrate of silver is removed, thereby preventing a too rapid decomposition of the toning bath. This applies to all toning baths.

Theoretically considered, it is proper that the last trace of silver nitrate should be removed, but those who are engaged in the daily practice of commercial work do not insist upon the strict observance of such a rule in all cases. An especial exception is permitted and advocated when dealing with prints from a weak or under exposed negative, this class being found to yield richer tones by not washing any of the free silver out.

The plan of soaking prints in a solution of sodium acetate was originally recommended, in lieu of a washing, by Mr. A. L. Henderson, as long ago as 1861, the following being an outline of the method suggested by him: Slightly overprinted proofs are soaked in a bath composed of—

Sodium acetate	240 grn.
Water	10 oz.

The unwashed proofs are moved about in this solution at least ten minutes, in order to convert all the free silver nitrate into acetate of silver. After slight rinsing in clean water, the proofs are toned with—

Gold terchloride	4 grn.
Sodium acetate	240 grn.
Water	10 oz.

1. Chloride of gold 1 grn.
Acetate of soda 30 grn.
Water 8 oz.

This must not be used till one day after preparation. It keeps well, and gives warm, rich tones.

2. Chloride of gold 1 grn.
Bicarbonate of soda 4 grn.
Water 8 oz.

This is ready for immediate use after preparation, but it will not keep.

3. Chloride of gold 1 grn.
Phosphate of soda 20 grn.
Water 8 oz.

This gives rich tones of a deep purple nature, but must be used soon after preparation.

4. Gold solution.....10 drm.
Acetate of lime.....20 grn.
Chloride of lime.....1 grn.
Tepid water.....20 oz.

The gold solution before mentioned is prepared by neutralizing as much as is required of a 1 gr. solution of chloride of gold by shaking it up with a little prepared chalk, then allowing it to settle, and filtering off the clear liquid. This toning bath improves by keeping. To use, add 2 oz. of it to 8 oz. of tepid water, which will prove sufficient to tone a full-sized sheet of paper.

5. Chloride of gold.....15 grn.
Water.....5 oz.

Neutralize with lime water; make up to 15 oz. with water, and add 2 drm. chloride of calcium. This stock solution will keep for a long time. For use, dilute 1 oz. with 10 oz. of water.

6. Platinum tetrachloride, sirupy solution, color of old East India sherry.....5 min.
Hydrochloric acid.....150 min.
Water.....20 oz.

Wash away the free silver thoroughly, warm the toning solution to 70° F., and fix in a 20% hypo. bath.

7. Mr. A. Watt, in the second volume of the *News*, gives a formula which runs as follows.

Solution of platinum.....30 min.
Hypo.....3 gr.
Hydrochloric acid.....5 min.
Water.....5 oz.

This bath is said to act instantly. The strength of the platinum solution here given is indefinite, but any of our experimental members can soon ascertain the amount of dilution necessary to obtain the most favorable results.

Alkaline Toning.—Owing to the bleaching action which occurs in toning silver prints with gold, which is slightly acid, certain experiments were made, and it was found that bleaching increased in proportion to the quantity of hydrochloric acid added. Now, in the action of toning chlorine is disengaged, and in order to render this powerful bleaching agent inert it has been proposed to introduce a substance capable of combining with it, and thus, in absorbing it, prevent undue loss of vigor. To obtain this a slightly alkaline toning bath became a necessity.

8. Sodium carbonate ($Na_2H\ Co_3$)... 5 gr.
Auric terchloride ($AuCl_3$).....1 gr.
Water.....10 oz.

Instead of the dry bicarbonate we will use a saturated solution. In this, as well as the following formulas, 3 prints of the same subject should be toned, viz., ordinary, fumed and preserved.

9. Sesquichloride of gold.....15 gr.
Phosphate of soda.....300 gr.
Distilled water.....1¾ pt.

And in the same communication it is mentioned that 180 grn. of borax may be substituted for the phosphate with a like result. Therefore it will be seen that a borax toning bath is not of recent discovery, although it does not appear to have been quoted in many formulæ for at least a dozen years after its publication.

10. Gold terchloride.....1 grn.
Sodium acetate.....10 grn.
Sedium chloride.....10 grn.
Hot water.....20 oz.

Mix twenty-four hours before use. Neutralize with chalk or whitening (carbonate of lime).

11. Ready Sensitized Paper, Bath for.—

1. Water.....1 liter.
Chloride of gold.....1 grm.
2. Water.....1 liter.
Borax.....10 grm.
Tungstate of soda.....40 grm.

12 Schwier's Borax Toning Bath.—

Chloride of gold solution, 1:50... 3 c. c.
Borax solution, 1 to 10.....100 c. c.
Water, distilled.....100 c. c.

Ready at once.

13. E. L. Wilson's Toning Bath.—

Water.....16 fl. oz.
Acetate sodium.....30 grn.
Chloride sodium.....30 grn.
Chloride gold.....2 grn.
Nitrate uranium.....2 grn.

The gold and uranium, previously dissolved in a little water, must be neutralized with sufficient bicarbonate soda. Add gold to renew as required.

14. Terchloride of gold, 1% solution. 1 part.
Hyperchloride of lime (white powder).....3 parts.
Distilled water.....1,000 parts.

The action is complete in ten to fifteen minutes, when the prints require washing in two changes of water to free them from the chloride of lime remaining in the fibers previous to fixing in 1 to 6 of hypo. If the tone is satisfactory at the expiration of fifteen minutes, the ordinary washing could be proceeded with.

15. If not, the proofs are submitted to a final bath composed of—

Gold terchloride.....2 parts.
Hypo.....200 parts.
Distilled water.....1,200 parts.

The proof ought not to be left in this bath less than 15 minutes, as that is the minimum time necessary to insure the permanency of the picture; but it may be allowed to remain in it for as much longer as is requisite for obtaining the desired tone.

16. The uranium and gold toning bath has many friends. The tones are said to be richer, and to economize gold, while it is very easy to work. The originator of the formula is unknown, but the following formula is recommended. After washing away the free silver tone in the following mixture:

No. 1.

One grn. acid solution of gold terchloride.....1 oz.
Water.....7 oz.

Neutralize with sufficient of a 20% solution of sodium carb. (Na_2HCo_3).

No. 2.

Three grn. solution of uranium nitrate.....1 oz.
Water.....7 oz.

Neutralize as in No. 1. Warm each to 70° F., and mix. The bath is then ready for use. It can be used repeatedly if desired, by acidifying with citric acid and neutralizing before use; but nothing is gained by using it a second time.

Miscellaneous Toning Baths.—1. To Obtain Black Tones on Silver Prints.—Scholzig prints on sensitized albumenized paper under green or dark yellow glass, and tones with borax, 90 grn.; uranium nitrate, 4 grn.; gold chloride, 3 grn.; water, 24 oz. Teape prints under green glass, and tones with gold chloride, 1 grn; saturated solution of borax, 1 oz.; water, 6 oz. (*Phot. N.*, xxxiv., 623). Slightly washed prints absorb more gold in toning and give more permanent images than well washed prints (*ibid.*, 639). The effects observed when silver printing is carried on under green glass are due to the specific action of the rays transmitted by the glass. Signal green absorbs the greater part of the rays that act on silver chloride, but transmits rays that act upon silver albuminate or silver citrate. When albumenized paper is printed under green glass the image con-

sists almost entirely of altered silver albuminate, while with gelatino-citrochloride under similar conditions the image consists of altered silver citrate.—(Abney, *Phot.* ii., 702-704).

2. Platinum or palladium toning can be effected by means of a slightly acidulated solution of platinic or palladic chloride mixed with sodium sulphite.

The gradual decomposition of toning baths containing platinum and silver metals can be prevented by the addition of one of the highest salts of the particular metal. For example—Platinum Toning Bath: Potassium chloroplatinite, 1·5 part; platinum tetrachloride, 0·05 part; acetic acid, 15 parts; water, 1,000 parts.

3. Osmium Toning Bath.—Ammonium osmiochloride, 1·50 part; potassium osmate, 0·1 part; acetic acid, 15 parts; water, 1,000 parts. Similar baths are used in the case of iridium toning or palladium toning. The quantity of the higher salt present in each case is not sufficient to injure the prints.—(P. Mercier, *B. S. F., Phot.* [2], vi., 194, 195).

4.—Acetate and Bicarbonate Bath.—

Acetate of soda	120	grn.
Bicarbonate of soda	10	grn.
Chloride of gold	4	grn.
Water	20	oz.

Make up fully twenty-four hours previously to its being required. The bath keeps indefinitely, and gives rich, warm brown tones. The prints for this bath should be printed deep. The toning will be complete when all the red has disappeared from the prints, except in the shadows, when examined by reflected light.

5.—Borax Bath.—For Warm Brown Tones.

Borax	100	grn.
Water	10	oz.
Chloride of gold	1	grn.
Water	10	oz.

Mix. This bath will not keep, and should only be prepared as required, and then thrown away. One grn. of gold is sufficient to tone 1 sheet of paper. The borax bath will suit all the ready-sensitized papers in the market Use powdered borax, and dissolve it in hot water. Afterward make up to 10 oz. Next add 1 grn. of chloride of gold, or 1 drm. of gold solution, to 10 oz. of water, and then mix the two solutions.

6. Gastine's Platinum Toning Bath.—

Chloride of platinum	15	grn.
Chloride of sodium	60	grn.
Bitartrate of soda	18	grn.
Water	3½	oz.

First dissolve the platinum and chloride of sodium, and bring the solution to the boiling point. Add the bitartrate slowly with constant stirring. This bath will keep, but is to be diluted ten to twelve times with water for use. Purple black tones are obtained by a long immersion; for sepia, tone less.

7. Platinum Toning Bath.—To make a platinum toning bath substitute platinum chloride for gold chloride in the acetate of soda bath; thus:

Platinum chloride	1	gr.
Acetate of soda	30	gr.
Water	8	oz.

Dip a piece of blue litmus paper into the bath; if it turns red it is acid, and a solution of carbonate of soda must be added, drop by drop, until the blue color returns.

8. Spaulding's Stock Solution.—

Water	5	oz.
Gold chloride	5	grn.

For use take—

Water	4	oz.
Soda bicarbonate	1	grn.
Common salt	2	grn.
Stock solution of gold	1	oz.

9. Tungstate of Soda Toning Bath—

1. Water	16	oz.
Borax	20	grn.
Tungstate of soda	75	grn.
2. Water	4	oz.
Chloride of gold	4	grn.

Mix 8 oz. of No. 1 with 1 oz. of No. 2, and allow the mixture to stand half an hour before using.

10. Toning and Fixing in One Bath.—The operation of toning and fixing is much simplified by using the combined bath. The print coming out of the printing frame is left in the bath till the color is arrived at, then washed and dried. The bath is composed of two solutions, and will keep for a long time. Dissolve water, 24 oz.; hyposulphite of soda, 6 oz.; sulphocyanide of ammonia, 1 oz.; acetate of soda, 1½ oz.; saturated solution of alum, 2 oz. Fill the bottle containing the solution with scraps of sensitized paper, bad prints that are not fixed, and leave it for a day. Then filter, and add the following solution; Water, 6 oz.; chloride of gold, 15 gr.; chloride of ammonium, 30 gr. It is necessary to print deep enough, and to leave the prints in the bath till, in looking through them, the desired color, brown dark or bluish, is observed. Used for Omega and other paper.

11. Toning and Fixing in One Bath.—

Chloride of gold	1	gr.
Phosphate of soda	15	gr.
Sulphocyanide of ammonium	25	gr.
Hyposulphite of soda	240	gr.
Water	2	oz.

Dissolve the gold separately in a small quantity of water and add it to the other solution.

12. Combined Toning and Fixing Bath.—

Water	32	oz.
Hypo	8	oz.
Chloride of gold	15	gr.
Nitrate of lead (c. p.)	75	gr.

13. Bromide Prints, Toning with Platinum.—

Potassium plantino-chloride	7	gr.
Distilled water	16	oz.
Hydrochloric acid	1¼	dr.

For twenty minutes, wash and soak to a 15% solution of copper chloride.—*E. Vogel.*

14. Brown Tones on Bromide Paper.—Dr. Miethe states that good brown tones may be given to bromide prints by a short treatment of the fixed and well washed prints in—

Bichloride of mercury	10	parts.
Common salt	10	parts.
Water	500	parts.

15. Black Tones on Gelatino-Chloride Paper.—The following bath gives very rich dark tones:

Chloride of gold	5	grn.
Nitrate of uranium	5	grn.
Bicarbonate of soda	75	grn.
Distilled water	4	oz.

16. Black Tones on Matt Surface Prints.—A very good toning bath for prints on matt surface paper is:

Borax	90	grn.
Nitrate of uranium	4	grn.
Gold	3	grn.
Water	24	oz.

The above quantity of gold is sufficient to tone at least three dozen whole plate prints. If more are to be toned the proportions of gold and uranium should be increased. The bath remains in good condition for a long time, but fresh gold must be added occasionally to keep the bath up to strength.

17. Gelatino-Chloride Paper, Toning and Fixing.—

Solution No. 1.

Hyposulphite of soda	200	grm.
Alum	80	grm.
Nitrate of lead (pulverized)	2	grm.
Boiling water	400	c. c.

The solution is allowed to stand for two days; then once more 400 c. c. of boiling water are added, and the solution is filtered. Meantime, the following solution is prepared in a bottle:

Solution No. 2.

Sulphocyanide of ammonia. ...160 grm.
Water.... ....1,200 c. c.

Solution No. 1 is mixed with solution No. 2, and then added:

Solution of gold chloride (1%).....10 to 20 c.c.

With this bath the prints take any desired tone within three to five minutes.

18. Toning Bromide Prints.—By M. V. Portman.—The following toning bath answers well, after fixing, if the print is at all green:

Sulphocyanide of ammonium ...30 grn.
Chloride of gold .... 1 grn.
Water..... .... 4 oz.

Half a minute in this bath will give the print a rich black tone; a longer time will turn the print blue, which answers very well for moonlight effects.

19. Experiments in Toning Gelatino-Chloride Paper.—From the *Photographic News* we take the following: The use of paper coated with a gelatino-citro-chloride emulsion in place of albumenized paper appears to be becoming daily more common. Successful toning has generally been the difficulty with such paper, the alkaline baths commonly in use with albumenized having proved unsuitable for toning this paper. On the whole the bath that has given the best results is one containing, in addition to gold, a small quantity of hypo. and a considerable quantity of sulphocyanide of ammonium. Such a bath tones very rapidly, and gives most pleasing colors. It appears, moreover, to be impossible to over tone the citro-chloro-emulsion paper with it in the sense that it is possible to over tone prints on albumenized paper with the ordinary alkaline bath. That is to say, it is impossible to produce a slaty gray image. The result of prolonged toning is merely an image of an engraving black color. Of this, however, we shall say more hereafter. We wish first of all to refer to an elaborate series of experiments by Lionel Clark on the effects of various toning baths used with the gelatino-citrochloride paper.

The results of these experiments we have before us at the time of writing, and we may at once say that, from the manner in which the experiments have been carried out and in which the results have been tabulated, Lionel Clark's work forms a very useful contribution to our photographic knowledge, and a contribution that will become more and more useful, the longer the results of the experiments are kept. A number of small prints have been prepared. Of these several- in most cases, three—have been toned by a certain bath, and each print has been torn in two. One-half has been treated with bichloride of mercury, so as to bleach such portion of the image as is of silver, and finally the prints—the two halves of each being brought close together—have been mounted in groups, each group containing all the prints toned by a certain formula, with full information tabulated.

The only improvement we could suggest in the arrangement is that all the prints should have been from the same negative, or from only three negatives, so that we should have prints from the same negatives in every group, and should the better be able to compare the results of the toning baths. Probably, however, the indifferent light of the present season of the year made it difficult to get a sufficiency of prints from one negative.

The following is a description of the toning baths used and of the appearance of the prints. We refer, in the meantime, only to those halves that have not been treated with bichloride of mercury.

1. Gold chloride ($AuCl_3$)..... 1 grn.
Sulphocyanide of potassium ....10 grn.
Hyposulphite of soda..... ½ grn.
Water..... 2 oz.

The prints are of a brilliant purple or violet color.

2. Gold chloride.... ..... 1 grn.
Sulphocyanide of potassium.....10 grn.
Hyposulphite of soda ..... ½ grn.
Water ..... 4 oz.

There is only one print which is of a brown color, and in every way inferior to those toned with the first bath.

3. Gold chloride..... ..... 1 grn.
Sulphocyanide of potassium.....12 grn.
Hyposulphite of soda .... ½ grn.
Water..... 2 oz.

The prints toned by this bath are, in our opinion, the finest of the whole. The tone is a purple of the most brilliant and pleasing shade.

4. Gold chloride .. .. 1 gr.
Sulphocyanide of potassium.....20 gr.
Hyposulphite of soda... ..... 5 gr.
Water..... 2 oz.

There is only one print, but it is from the same negative as one of the No. 3 group. It is very inferior to that in No. 3, the color less pleasant, and the appearance generally as if the details of the lights had been bleached by the large quantity either of hypo. or of sulphocyanide of potassium.

5. Gold chloride..... ..... 1 gr.
Sulphocyanide of potassium.....50 gr.
Hyposulphite of soda ..... ½ gr.
Water... .... 2 oz.

Opposite to this description of formula there are no prints, but the following is written: "These prints were completely destroyed, the sulphocyanide of potassium (probably) dissolving off the gelatine."

6. Gold chloride..... ... 1 gr.
Sulphocyanide of potassium.....20 gr.
Hypo..... ..... 5 gr.
Carbonate of soda.... .....10 gr.
Water..... ..... 2 oz.

This, it will be seen, is the same as 4, but that the solution is rendered alkaline with carbonate of soda. The result of the alkalinity certainly appears to be good, the color is more pleasing than that produced by No. 4, and there is less appearance of bleaching. It must be borne in mind in this connection that the paper itself is strongly acid, and that, unless special means be taken to prevent it, the toning bath is sure to be more or less acid.

7. Gold chloride... .... 1 gr.
Acetate of soda..... .. 30 gr.
Water..... ..... 2 oz.

The color of the prints toned by this bath is not exceedingly pleasing. It is a brown tending to purple, but is not very pure or bright. The results show, however, the possibility of toning the gelatino-chloro-citrate paper with the ordinary acetate bath if it be only made concentrated enough.

8. Gold chloride..... 1 gr.
Carbonate of soda..... 3 gr.
Water..... 2 oz.

Very much the same may be said of the prints toned by this bath as of those toned by No. 7. The color is not very good, nor is the toning quite even. This last remark applies to No. 7 batch as well as No. 8.

9. Gold chloride..... .. 1 gr.
Phosphate of soda.....20 gr.
Water ..... 2 oz.

The results of this bath can best be described as purplish in color. They are decidedly more pleasing than those of 7 or 8, but are not as good as the best by the sulphocyanide bath.

10. Gold Chloride..... . . 1 grn.
Hyposulphite of soda..... ½ oz.
Water..... 2 oz.

The result of this bath is a brilliant brown color, what might indeed, perhaps, be best described as a red. Two out of the three prints are much too dark, indicating, perhaps, that this toning bath did not have any tendency to reduce the intensity of the image.

The general lesson taught by Clark's experiments is that the sulphocyanide bath gives better results than any other. A certain proportion of the ingredients—namely, that of bath 3—gives better results than any other proportions tried, and about as good as any that could be hoped for. Any of the ordinary alkaline toning baths may be used, but they all give results inferior to those got by the sulphocyanide bath. The best of the ordinary baths is, however, the phosphate of soda.

And now a word as to those parts of the prints which have been treated with bichloride of mercury. The thing that strikes us as remarkable in connection with them is that in them the image has scarcely suffered any reduction of intensity at all. In most cases there has been a disagreeable change of color, but it is almost entirely confined to the whites and lighter tints, which are turned to a more or less dirty yellow. Even in the case of the prints toned by bath No. 10, where the image is quite red, it has suffered no appreciable reduction of intensity.

This would indicate that an unusually large proportion of the toned image consists of gold, and this idea is confirmed by the fact that to tone a sheet of gelatino-chloro-citrate paper requires several times as much gold as to tone a sheet of albumenized paper. Indeed, we believe that, with the emulsion paper, it is possible to replace the whole of the silver of the image with gold, thereby producing a permanent print. We have already said that the print may be left for any reasonable length of time in the toning bath without the destruction of its appearance, and we cannot but suppose that a very long immersion results in a complete substitution of gold for silver.

11. Toning Bath for Gelatino-Chloride Emulsion Paper.

Wash the prints in clean water and then tone in the following:

A. Distilled water..... 25 oz.
Acetate of soda (recrystillized). 1 oz.
Into which pour a solution of
1% of chloride of gold..... ... 2 oz.

B. In 10 oz. of distilled water dissolve 2 drm. of sulpho-cyanide of ammonia, and add 1 oz. solution of 1% chloride of gold.

For toning, mix in the proportion of 20 oz. of A to 6 of B, if possible the evening before using.

12. Transparencies on Silver Paper.

Print on the back of heavily-silvered paper until the picture is well printed, viewing the paper by transmitted light.

Tone and fix, make the paper translucent, when dry, with—

Poppy oil..... ... ½ oz.
Balsam fir..... ⅛ oz.
Spirits of turpentine..... ¼ oz.

Trays, to Make.—Use wood, and smear over with 4 parts resin, 1 part gutta percha and a little boiled oil, melted together and applied hot to the perfectly dry wood. Do not use zinc.

Trays and Graduates, to Clean.—Wash with nitric acid and use a rag.

Silver Wastes, to Recover.—I. From Nitrate Bath.—1. Add solution of caustic potash or lime, as long as there is a brown precipitate. Allow it to settle, pour off the liquid and collect silver oxide for reduction; vide III. below.

2. For 1 lb. of silver add 1 oz. sulphuric acid and ½ lb. zinc and allow it to stand two days. Precipitate as a chloride, wash 8 or 10 times by decantation, and dissolve gradually in nitric acid. Test the complete washing by hydrochloric acid. Wash with water till zinc nitrate is removed. If zinc clings to silver, wash with hydrochloric acid.

3. Suspend a sheet of copper in bath for two or three days.

4. Acidify as nitric acid, precipitate as silver chloride by sodium chloride or hydrochloric acid and reduce as III.

5. Immerse in bath 2 strips of copper attached to a Daniell's battery. Silver deposited on the copper as in No. 3.

6. Add sodium bicarbonate or hydrate. Reduce as in III. below, or, if pure enough, dissolve precipitate at once in nitric acid.

7. Concentrate bath made alkaline by sodium carbonate and add aqueous solution of oxalic acid neutralized with sodium carbonate. Filter, dry and fuse with equal weight of sodium bicarbonate.

8. Deposit either with or without a battery on iron. Fuse with potassium nitrate and sodium carbonate.

II. Hyposulphite Bath.—1. Precipitate as silver sulphide by potassium sulphide. Reduce as III. or dissolve in nitric acid.

2. Precipitate with hydrosulphuric acid, and reduce as III.

3. Decompose hypo. by waste nitrosulphuric acid from manufacture of gun cotton for collodion. Have silver sulphide and sulphur with sodium nitrate and sulphate in solution. Suspend zinc in the solution, then boil two or three hours; wash on filter, dry, fuse with borax and sodium carbonate.

4. Suspend sheet copper in the solution.

5. Add hydrochloric acid, which sets free sulphur and precipitates silver chloride. Oxidize the sulphur by aqua regia and reduce silver chloride as in III.

6. Add sodium hypochlorite to the alkaline solution. Wash, precipitate and fuse with mixed carbonates. This gives no fumes of sulphur. Sodium bisulphate and chlorides are by-products.

III. Reduction of Silver Chloride, Oxide or Sulphide.—1. Mix with ⅛ its weight of colophony. Heat moderately in a crucible till greenish-blue flame ceases, then suddenly increase the heat, when a button of the metal is obtained.

2. Melt with alkaline carbonates enough to cover surface from air; then mix with 75% chalk and 4% charcoal, and heat.

3. Ignite with niter on red hot plate, carefully, and in small quantities to avoid explosions, run down to a bead with sodium carbonate and borax.

4. If a chloride, reduce to an oxide by boiling with strong potash, then reduce by glucose; or boil the chloride with glucose and sodium carbonate.

5. Add silver chloride dissolved in ammonia to a boiling solution of 1 part glucose and 3 parts sodium carbonate in 40% of water, keeping up the boiling all the time.

6. Add to silver chloride sodium hydrate in solution and grape sugar, and expose to sunlight in an open dish with occasional stirring. Reduce to dark brown oxide of silver soluble in nitric acid.

7. Mix with five times its weight of sodium carbonate. Fill a Hessian crucible half full and sprinkle sodium chloride over the top. Heat slowly in anthracite fire. After half an hour increase the heat until the crucible is white hot. When complete fusion has taken place, allow to cool and break out the button of silver.

8. Fuse with 2 parts carbonate sodium and potassium mixed.

9. Add pure zinc and dilute sulphuric acid and let it stand two days. Wash silver off with water acidulated with sulphuric acid to remove all zinc; finally fuse to a button.

10. Mix one half its weight dry sodium carbonate and one quarter its weight of dry clean sand and ignite.

IV. *a.* Gold Wastes, Recovered.—1. Make

just acid with hydrochloric acid, add solution containing 2 oz. pyrogallic acid, let it stand twenty-four hours; filter, dissolve in aqua regia, and product, after evaporation, will be found better for toning than that precipitated by iron.

2. Acidify toning bath, and add sulphate of iron, 2 grm., to 1 grm. chloride of gold.

b. Separated from Silver.—1. Treat button obtained by fusing waste from hypo. baths, toning and fixing, with dilute nitric acid. Wash insoluble part with ammonia to remove silver chloride, if present, and dissolve in aqua regia.

2. Digest 20 grm. in flask with 1 fl. drm. hydrochloric acid, 15 mm. of nitric acid, and 2 drm. of water. After fifteen minutes boil, add 2 oz. water; filter. Silver chloride with organic matter left undissolved. Reduced as III., above.

V. Paper Wastes.—1. Soak paper in strong solution of saltpeter and burn.

2. Treat with nitric acid, precipitate with sodium chloride or potassium hydrate. Then put with III., above, for reduction.

VI. Cyanide Solution.—1. Dilute with water, precipitate by (2) potassium sulphide, (2) sodium chloride, and reduce as III.

2. Decant bath into iron kettle, warm, add ferrous sulphate, slowly, till a slight precipitate of oxide is formed. Make alkaline, and add solution of grape sugar until of a brownish yellow color. Allow to settle, siphon off the liquid. Wash sediment on filter, and ignite to recover silver.

VII. Developer.—1. See II., 3, 4, 5, 6, with hypo. bath; 1 and 2 not applicable, for iron sulphide would be formed.

2. Reduced by its own iron, if ferrous sulphate.

Reduction of Photographic Wastes.—The following recipes are the result of the experiences of many. Some of the notes are very important. If followed closely you may, as other people have done, reduce photographic wastes to $\frac{999}{1000}$ fine.

Paper Clippings.—Burn the papers to a fine ash; then mix with 1½ its weight of the following flux:

Bicarbonate of soda	1	lb.
Pearlash	1	lb.
Common salt	4	oz.

Silver Paper, to Reduce.—Burn all your papers and preserve the ashes thereof, then add nitric acid until all the silver is extracted, and filter through muslin cloth. Now add common salt to form silver chloride, and evaporate to dryness, and reduce to metallic silver in crucible by adding 2 parts of sodium carbonate and a modicum of borax to one of silver chloride. Mix well and heat gradually at first, and finish with white heat, then wash well until nothing but silver remains. Treat washings with salt, evaporate to dryness, and reduce as above in crucible.

Recovery of Silver from Hypo Bath.—The *Photographische Wochenblatt* recommends the precipitation of silver from the fixing bath with an old oxalate developer that still contains enough protoxide for this purpose. The precipitate is in a very fine state of division and difficult to filter.

Silver from Waste Solutions.—One of the simplest methods of recovering silver from waste solutions is the following: First dilute the liquid about one-third with water (double this quantity if much gum is present), heat the solution to about 180° Fah., and gradually add solution of pure sulphate of iron (iron sulphate 5 oz., water 1 pt.) until no further precipitate forms. Decant the liquid portion, throw the precipitate on a filter and wash it thoroughly with hot water. To the washed precipitate—consisting of finely divided metallic silver—add strong pure nitric acid and heat over a water bath until the silver has all been dissolved. Evaporate to dryness over the water bath (in a porcelain dish, capsule) and dissolve the residue in hot water (distilled or rain). Filter this solution and concentrate it over a water bath, then set it aside to crystallize. Remove the crystals, concentrate in a similar manner the mother liquid and obtain another crop of crystals. These crystals (of nitrate of silver) are pure enough for ordinary purposes, but if required to be used for photographic purposes they should be redissolved in water and recrystallized. Where the liquid containing the silver contains also much insoluble organic matter, it is sometimes preferable to separate the silver by evaporating the liquid to dryness and fusing the residue with an equal quantity of borax glass in a blacklead crucible.

Waxing Solution.—For carbon prints, or for removing collodion films.—Beeswax, 40 grn.; benzole (rectified), 8 oz.

Phylloxera, to Destroy.—Numberless remedies have been suggested and tried: sulphur, carbon bisulphide, coal-tar, lime, soap, caustic soda, and many others. The following are among the best receipts: See the *Scientific American Supplement*, Nos. 167, 205, 464, 471, 478.

1. Try sulpho-carbonate of potassium and sand.

2. London purple, a by-product in the manufacture of rosaniline, mixed with water.

3. Forty-five lb. sodium phosphate; 15 lb. ammonium phosphate; 60 lb. ammonium chloride; 45 lb. potassium sulphate; 75 lb. of soda; 2,800 lbs. iron sulphate; 90 lb. flowers of sulphur. Mix with the soil.

4. Mix 45 parts nitrobenzol; 75 parts sulphuric acid; 1,400 parts water. To kill the eggs, make a paste of 4 oz. benzol, 8 lb. lime, and 360 lb. of earth. See **Insecticides.**

Pianos, Finishing the Case of.—The polish finishing of piano cases requires experience to assure success. The cases are first smoothed with a planing machine or hand planes, and then are scraped and smoothly sandpapered. They are then stained, and a filler—a rosewood paste for instance—is carefully rubbed in, to completely fill the pores of the wood. A rubbing coat of varnish is then applied, this coat really being four or five coats applied four or five days apart. When thoroughly dry this rubbing coat is rubbed down perfectly smooth with ground pumice, felt rubbers and water. Then a flowing or finishing coat of varnish is skilfully applied, and when dry it is fine rubbed and rottenstoned, using water and the palms of the hands in this operation, which removes all scratches and leaves a bright polish, which is completely finished by rubbing off with oil. In finer classes of work a scraping coat is applied after the filler is rubbed into the pores, and when dry this scraping coat (which is really four or five coats of varnish applied four or five days apart) is carefully scraped off by steel plate scrapers, a delicate operation, then the rubbing coat above named is applied, and later the flowing coat and oil finish. The original smoothing is not done by emery belts, but by machine or hand smoothing planes, scraping and sandpapering. It requires about three months' time to polish a piano case, and the work should be intrusted to skilful, experienced hands.

Piano Keys, to Bleach. See **Bleaching.**

Pickle to Remove Scale from Iron Caused by Heat.—Use by volume sulphuric acid, 1 part; 1 part nitric acid, 2 parts water, applied warm. Either the acid or the iron may be heated.

Pickle for Beef.—Pickle to keep beef, tongues and pork. To each gallon of water add 1½ lb. salt, ½ lb. sugar, ½ oz. saltpeter, and ½ oz. potash. Let these be boiled together until all the dirt from the sugar rises to the top and is skimmed off. Then throw it into a tub to cool,

and when cold pour it over the beef or meat, to remain the usual time, say 4 or 5 weeks. The meat must be well covered with pickle, and should not be put down for at least 2 days after killing, during which time it should be slightly sprinkled with saltpeter, which removes all the surface blood, etc., leaving the meat fresh and clean. Some omit boiling the pickle and find it to answer well, though the operation of boiling purifies the pickle by throwing off the dirt always found in salt and sugar.

Pick-me-Up.—There is no general formula for this. A pick-me-up is simply a tonic draught, somewhat like a liqueur. The following is good:

Essence of ginger	10 drops.
Aromatic spirit of ammonia	½ drm.
Tincture of gentian	1½ drm.
Compound tincture of cardamoms	3 drm.
Sirup	½ oz.
Chloroform water, to	2 oz.

Mix and take as a draught.

Pick-me-up for Dispensing.—To ½ gal. of sirup, add ½ oz. soluble extract of ginger, 1 oz. curacoa essence, 1 drm. sulphate of quinine dissolved in the essence, ½ oz. fruit acid solution. Color as desired.

Picric Acid.—Picric Acid, called also Carbazotic Acid or Trinitrophenol. A bright yellow crystalline body first obtained by the action of strong nitric acid upon indigo. It has subsequently been obtained by the action of the same acid upon silk waste, upon leather clippings, upon crude coal-tar and upon the resin of *Xanthorrhea hastilis*, known as yellow Australian gum. It is now manufactured from crystallized carbolic acid.

Picture Frames, Composition for. See **Compositions.**

Picture Frames, to Gild. See **Gilding.**

Pictures, Varnish for. See **Varnishes.**

Pigments. See also **Paints.**

Blacks.—Aniline Black.—Nigrosin, largely used in the preparation of inks, etc.

Blue black is a paste made of ivory black and indigo, ground together with water.

Black, Bone.—1. *Syn.* Animal Charcoal. The residuum of the distillation of bone spirit. Use. As a pigment; for making blacking; as a material for the moulds of founders; for clarifying and bleaching liquids, and for removing lime from sirup in refining sugar. Sold for ivory black.

2. *Syn.* Paris Black.—Turners' bone dust, burnt with great care in covered iron crucibles, and afterward ground very fine. Use. A beautiful black, works well both in oil and water; sold for real ivory black, and for burnt lampblack.

3. Bone Black.—In the preparation of bone black, the bones are first boiled in water to remove all the adhering grease (which is otherwise utilized), or, what is perhaps a better method, exhausting them of all grease, etc., by means of bisulphide of carbon. The bones are then thrown into a large retort and subjected to destructive distillation. At first there passes over a large quantity of a fetid gaseous matter, accompanied by a considerable quantity of carbonate of ammonia, and other volatile alkalies, formed on the type of ammonia. These gases and sublimates are passed through a large washer, which retains the ammonia and other salts accompanying the gas; after which the latter is conducted into the furnace and burned beneath the retort. As the distillatien proceeds, a quantity of tarry matter and oil comes over. After the operation is finished, the residue remaining in the retort constitutes the animal charcoal. The washing apparatus may consist of a large iron tank, half filled with water, and having a tightly fitting cup through which two pipes pass, one of which—the one leading immediately from the retort—passes down below the surface of the water. The gas, in its passage from the retort, is thus caused to bubble up through the water, and thence it is conveyed by the second pipe into the furnace, where it is burned. The water in the washer may be used several times, or until it becomes nearly saturated with the salts; it should then be drawn off through faucets arranged in the side of the tank, and the salts crystallized out by evaporation, dried, and prepared for market. The tar and oily water remaining in the tank, which are used for the preparation of lampblack, may be drawn off in like manner.

Brunswick. See **Microscopy.**

Black, Burnt Lamp.—Lampblack heated in a covered iron crucible until all its greasiness is burnt off. Use. As a water color. Paris black is usually sold for it.

Cork Black.—Name given to a black prepared by carbonizing fragments of cork.

Hartshorn Black.—This black has been nearly replaced by ivory black. It is prepared by carbonizing the residuum of the distillation of hartshorn.

Black, Frankfort.—This is obtained by burning the lees of wine from which the tartar has been washed; its principal use is in making ink.

Black, Ivory.—1. *Syn.* Cologne Black, Cassel Black. *Prep.* Put into a crucible, surrounded by burning coals, fragments or turnings of ivory, or of the osseous parts of animals, and cover it closely. The ivory or bones, by exposure to the heat, will be reduced to charcoal. When no more smoke is seen to pass through the joining of the cover leave the crucible over the fire for half an hour longer, or until it has completely cooled. There will then be found in it a hard carbonaceous matter, which must be pounded and ground on porphyry with water, washed on a filter with warm water and dried. Before it is used it must be again subjected to grinding. Remarks.—Black furnished by bones is reddish. That produced by ivory is more beautiful. It is brighter than black obtained from peach stones. When mixed in a proper dose with white lead, it forms a beautiful pearl gray. Ivory black has a very deep and rich color. The Cologne and Cassel blacks are formed from ivory.

2. Ivory Black.—Ivory black is a beautiful pigment prepared by carbonizing waste fragments and turnings of ivory. These are exposed to a red heat for some hours in crucibles, great care being taken to avoid overheating or burning. When quite cold the crucibles are opened and the contents pulverized, the richest colored fragments being kept apart for the best quality. The powder is then levigated on a porphyry slab, washed well with hot water on a filter and dried in an oven. The product is of a very beautiful velvety black color, superior even to that obtained from peach kernels, and quite free from the reddish tinge which so often characterizes bone black. Ivory black is employed by copperplate printers in the preparation of their ink. Mixed with white lead it affords a rich pearl gray pigment.

Black, Japan.—*Syn.* Bituminous Varnish. *Prep.* Fuse by a gentle heat 12 oz. of amber and 2 oz. of asphaltum, then add 2 oz. of black rosin and ½ a pt. of boiled oil; mix well, remove it from the fire, and when nearly cold, add ¾ pt. spirit of turpentine; mix well together. Use. To varnish metals.

Black, Lamp.—*Prep.* I. Suspend over a lamp a conical funnel of tin plate, having above it a pipe to convey from the apartment the smoke which escapes from the lamp. Large mushrooms, of a very black carbonaceous matter, and exceedingly light, will be formed at the summit of the cone. This carbon is reduced to such a state of division as cannot be given to any other matter, by grinding it on a piece

of porphyry. This black goes a great way in every kind of painting. It may be rendered less oily and drier by calcination in close vessels.

The funnel should be united to the pipe, which conveys off the smoke, by means of wire, because solder would be melted by the flame of the lamp.

Manganese Black.—Black oxide of manganese finely powdered.

Newcastle Black.—This is prepared from coal. The coal is carefully selected, then ground and elutriated.

Oporto Black.—This black is prepared from wine lees by carbonizing.

Paris Black.—Name given to an imitation of ivory black; it is made from fine bone chips.

Peach Stone Black.—Prepared from the kernels of peaches, cherries, etc. It is made like ivory black.

Rice Black.—1. This is made by carbonizing rice. It is very inferior.

2. Prepared by burning rice in close vessels. The color is very poor.

Sight Black.—1. Camphor smoke makes an excellent black, but has the disadvantage of coming off with the least touch or drop of rain.

2. A good and tolerably permanent black is made of 1 part stick lac, 1 of lampblack, and 6 parts of methylated spirit.

Soot Black.—This is the soot of fires ground and sifted. Very inferior, used extensively for a whitewash color.

Black, Spanish.—*Syn.* Cork Black.—Cork burnt in close vessels, and the charcoal ground and washed with water. A good color, and works very soft.

Sugar Black.—Sometimes called Jamaica black; it is prepared by carbonizing moist sugar.

Black, Wheat.—From wheat burnt in close vessels. Remarks.—A superior black, between ivory and lampblack; it has a full body and dries hard and quickly with oil.

Blues.—Antimony Blue.—Kraus prepares a fine blue, rivaling ultramarine, and capable of giving beautiful green shades (equal to Schweinfurth green, and without its arsenical character) when mixed with chrome yellow or with zinc chromate, by adding a solution of yellow (ferro) cyanide of potassium to one of antimony in aqua regia, and filtering through ground glass, as long as a precipitate forms. This precipitate contains no antimony, the antimony salt simply facilitating the formation of the pigment; mercury salts will also give it. The blue is soluble in hydrochloric acid, which successively renders it green and yellow; on standing, the blue color is restored. Alkalies immediately discompose it. In fact it is merely a variety of Prussian blue.

Antwerp Blue.—This is a mixture of Prussian blue, alumina, magnesia, and zinc oxide, in various proportions. It is prepared like Prussian blue, except that the zinc, magnesia, and alum are added to the lye of crude potassium ferrocyanide.

Azure, Egyptian.—*Prep.* Carbonate of soda, 1 lb.; calcined flints, 1½ lb.; copper filings, ¼ lb.; all in fine powder *Proc.* Mix and fuse them together in a crucible for two hours. When cold, reduce to an impalpable powder.

Remarks.—This is a most beautiful and permanent sky blue color. It is used in painting, and as a substitute for smalts.

Berlin Blue.—Take 3 parts alum and 1½ parts sulphate of iron, water, q. s. to dissolve them. Make a solution of yellow prussiate of potassium, with a little sulphuric acid added. Pour this second solution drop by drop into the first. This will form a precipitate which should be washed on a filter and dried.

Bice Blue.—This is a native carbonate of copper prepared by careful grinding and elutriation. It is largely adulterated.

Charcoal Blue.—Vine stalks are triturated after being carbonized with an equal weight of pearlash; the mixture is then heated until it ceases to swell. When it is cold it is dissolved in water and the excess of alkali is neutralized with sulphuric acid. The liquid now becomes blue and a dark precipitate falls down, which when dried and heated becomes of a brilliant blue color.

Blue, Chemic.—*Syn.* Saxon Blue, Liquid Blue, Sulphate of Indigo.—1. Indigo, 1 lb.; oil of vitriol, 8 lb. Put the acid into an earthenware pan placed in a tub of water to keep it cool, and add the indigo, previously reduced to fine powder, in small successive portions, carefully stirring to prevent it heating. When all the indigo has been added cover up the vessel and let it stand for four hours, occasionally stirring it during the time; lastly dilute it with an equal weight of water.

2. Indigo, 1 oz.; oil of vitriol, 4 oz.; dissolve as before; the next day add 1 oz. of dry potash, let it stand a day longer, then dilute it with 12 oz. of water.

Use, in dying greens and blues either without preparation or with a mordant of alum and tartar.

Blue, China.—*Syn.* Royal Smalts.—Grind together oxide of cobalt or zaffre with an equal weight of potash and 8 times its weight of feldspar. Then submit the mixture to fusion in a crucible. Use, to paint pottery and as a pigment.

Cobalt or Thénard Blue.—This might replace ultramarine but for its defect of having a violet hue by artificial light. Its full intensity of color is only developed after long exposure to the air, when it acquires a slightly green tint. The mode of preparing it is as follows: Roasted cobalt ore is heated with excess of dilute nitric acid, and the solution is evaporated nearly to dryness in a porcelain vessel. The residue is boiled with water and filtered, in order to remove the precipitated arseniate. Into the filtrate is poured a solution of basic phosphate of soda, which produces a precipitate of basic phosphate of cobalt. This is washed and collected on a filter. While still gelatinous 1 part of it is thoroughly mixed with 8 parts hydrated alumina, recently precipitated from a solution of potash alum by ammonia. The mixture is dried to brittleness and calcined at a cherry red heat for half an hour in a covered clay crucible. The resulting pigment is kept in glass jars. It is essential that the alumina be prepared with sufficient excess of ammonia, and washed several times with very clear water. Arseniate of cobalt may replace the phosphate, in which case only half the quantity of the cobalt salt is needed. It is asserted by Boullai-Marillac that by substituting lime for the alumina a richer and more velvety blue is produced.

Cobalt Blue or Regulus of Cobalt.—Sixty parts cobalt ore; 50 parts potash; 25 parts sand; 10 parts charcoal. Work the same way as for regulus of zaffre.

To Refine Regulus of Cobalt.—Fifty parts regulus of cobalt; 6 parts potash. Refine as for regulus of zaffre; the operation of refining must be repeated until the scoria is of a bright color and of a slight bluish hue; then spread the purified metal, finely pulverized, half an inch thick, on flat pieces of earthenware covered with flint; place in a reverberatory furnace and apply a moderate degree of heat for a few hours.

Blue, cobalt.—*Prep.* 1. Dissolve zaffre, 1 lb. in ¾ lb. of nitric acid, diluted with an equal weight of water, by digestion for some hours; evaporate nearly to dryness, then dissolve in warm water, filter and add a solution of phosphate of soda as long as any precipitate falls down; collect this on a filter and wash it with cold water, then mix it while still moist with 8 times its weight of freshly precipitate hydrate of alumina, also well washed and still moist. Stir them together until dry; lastly, expose the mixture to a cherry red heat in a crucible, after

which cool the mass, and reduce it to a fine powder.

2. Precipitate a solution of nitrate of cobalt as above, and proceed as before.

3. Make a strong solution of neutral nitrate of cobalt, and mix it with pure moist alumina, then dry it and proceed as before.

4. Precipitate a solution of nitrate of cobalt with ammonia alum, collect the precipitate, wash, dry, and heat it to a cherry red as before. A beautiful blue pigment, very permanent.

Cœruleum Blue.—This blue, for oil and water color painting, is introduced by Rowney & Co. It is entirely soluble in hot hydrochloric acid, and the light blue tint of the solution becomes violet red on diluting with water. The original color reappears by concentration, and the pigment is restored if the solution be evaporated to dryness. Nitric acid dissolves the cobalt and leaves a white residue, mostly composed of stannic acid. The green color shows the presence of small proportions of iron and nickel. Concentrated sulphuric acid does not dissolve it, but, diluted with 4 volumes of water, produces partial decomposition. Acetic acid and caustic potash do not act upon it. Cœruleum is principally a combination of a tin oxide with cobalt oxide. Berzelius mentions a stannate of cobalt, prepared by adding a solution of potash stannate to one of cobalt. The bluish precipitate formed becomes light red after washing, and then brown. Calcined at white heat, its color changes to a light blue. The composition of cœruleum is—

Oxide of tin (stannic acid)	49·66
Oxide of cobalt	18·66
Sulphate of lime and silica	31·68
	100·00

—*Riffault.*

Copper Blue.—A mixture of carbonate of copper and chalk, exposed to the air until it assumes the proper color.

Egyptian Blue.—A very beautiful shade of blue is noticeable upon many ancient monuments found in the tombs of Egypt. Analysis proves the color to be formed by a combination of soda, sand, and lime, with certain proportions of copper, from which substances the Egyptians prepared 3 different products: (1) A peculiar red, green, and blue glass; (2) a brilliant enamel; (3) the color to which reference is made, and which was used for painting. Péligot has succeeded in reproducing this shade of blue by heating together 73 parts silica with 16 oxide of copper, 8 lime, and 3 soda. If the temperature exceed 800° F. (426⅔° C.) a valueless black product results.

Indigo.—A product obtained from the indigo plant.

Blue, Iron.—*Prep.* Precipitate a filtered solution of protosulphate of iron, with another of phosphate of soda. Collect the powder, wash and dry it. A lively sky blue.

Blue (Laundry). See **Bluing.**

Leitch's blue, or cyanine blue, is a compound of cobalt blue and Prussian blue, and possesses properties which would be expected of a mixture of these two pigments. It has been found very durable under fairly severe exposure to light.

Lime Blue, Mountain Blue.—Mix powdered lime with a weak solution of copper nitrate so that all the lime is saturated; the precipitate is washed, drained and ground with 10% of lime, and afterward dried.

Manganate Blue.—In preparing calcium chloride by calcining a mixture of chalk and chlorine residues, Kuhlmann found in the furnaces a slag of bright blue color, consisting of manganate of lime. It resembles ultramarine, but, though not soluble in water, is not durable when in contact with it.

Blue, Molybdenum.—*Prep.* Dissolve sulphuride of molybdenum in nitric acid, then add some tin filings and a little muriatic acid. After digestion for some time, pour off the clear and evaporate to dryness. Mix the powder thus obtained with moist hydrate of alumina, as in making cobalt blue, and heat it to nearly a dull red.

Blue, Mountain.—Carbonate of copper mixed with earthy matter.

Mountain Blue.—In 9 to 12 parts of boiling water dissolve equal parts of sulphate of copper and common salt. Dilute this with 45 parts cold water; filter, and precipitate the oxide of copper with milk of lime. After twenty-four hours remove the oxide of copper which has been precipitated, wash thoroughly, cut in small cakes, and dry. Put the dry cakes in lime paste, let them remain three weeks, turning them often with great care. Dilute the lime with water, take out the cakes which have turned blue, wash, dry and grind.

Paris or Turnbull's Blue.—1. A thorough mixture of 2 parts sulphur and 1 part dry soda carbonate is gradually heated in a covered crucible to redness or till fused; a mixture of soda silicate and aluminate is sprinkled in, and the heat is continued for an hour; the little free sulphur present may be washed out by water.

2. An intimate mixture of 37 parts China clay, 15 parts soda sulphate, 22 parts soda carbonate, 18 parts sulphur and 8 parts charcoal, is heated in large crucibles for twenty-four to thirty hours; the mass is reheated in cast iron boxes at a moderate temperature till the desired tint appears, and is finally pulverized, washed and dried.

Prussian Blue.—*Syn.* Berlin Blue, Prussiate of Iron, Ferroprussiate of do., Cyanuret of do., Ferrocyanide of do., Percyanide of do., Sesquiferrocyanide of do., Cyanure ferrosoferrique (Berzelius); Eisenblausäures eisenoxyd, Berlinerblau (Ger.); Bleu de Prusse, Prussiate de Fer (Fr.); Ferri Percyanidum (P. L.); do. Cyanuretum (P. D.); do. ferrosesquicyanidum.—*Prep.* I. Precipitate the crude but clear solution of prussiate of potash, blood lye, by a mixed solution of 2 parts of alum, and 1 part of green sulphate of iron. The dingy green precipitate that falls gradually becomes blue by absorption of atmospheric oxygen, which is promoted by exposure and agitation of the liquor. As soon as it has acquired its full color, the whole must be allowed to repose, the clear portion decanted, and the sediment repeatedly washed with water, drained, and dried, at first in a stove, but afterward on chalk stones.

II. Partly saturate the free alkali in the crude lye, with dilute sulphuric acid, before precipitation. Very superior.

III. Repeatedly digest and wash the precipitate obtained by either of the above processes, in very dilute muriatic acid, and then in pure water; drain and dry. Superior.

IV. Paris Blue.—Neutralize the solution of prussiate of potash above, with dilute sulphuric acid, and precipitate with a solution of any persalt of iron (as the persulphate, nitrate, sesquichloride, or peracetate); well wash and dry the precipitate. A very rich and intense color.

V. (Hochstätter.)—Crystallized prussiate of potash and green vitriol, of each 6 parts; dissolve each separately in water, 15 parts; then add oil of vitriol, 1 part; fuming muriatic acid, 24 parts; agitate well. After some hours, treat the whole with chloride of lime, 1 part, dissolved in water, 80 parts, and strained, observing to stop the addition of the latter solution as soon as an effervescence from the escape of chlorine gas is observed; after standing some hours, thoroughly wash the precipitate, and dry it; or, instead of the above, at once wash the precipitate in dilute nitric acid, till it acquires a deep blue color.

Smalt Blue.—A glass colored with oxide of cobalt, and pulverized.

Smalts.—32 parts, sand; 32, potash; 10, borax; 1, blue calx. These smalts, the materials of which are calcined in the usual manner, when

finely pulverized will produce a fine, rich-looking blue powder.

Smalts.—*Syn.* Powder Blue, Smalta, Azurum.—*Prep.* I. Roast cobalt ore to drive off the arsenic, make the residium into a paste with oil of vitriol, and heat it to redness for an hour; powder, dissolve in water, and precipitate the oxide of iron by carbonate of potash, gradually added, until a rose colored powder begins to fall, then decant the clear, and precipitate by a solution of silicate of potash prepared by fusing together for 5 hours a mixture of 10 parts of potash, 15 parts of finely ground flints, and 1 part of charcoal. The precipitate, after being dried, may be fused and powdered. Very fine.

II. Roasted cobalt ore and potash, of each 1 part; silicious sand 3 parts; fuse together, cool, and powder. Used in painting, to color glass, and to get up linen.

Blue, Soluble.—7 parts oil of vitriol, place in a glass vessel, and set this in cold water; add gradually 1 part indigo in powder, stirring the mixture at each addition with a glass rod. Cover the vessel for twenty-four hours, then dilute with an equal quantity of water.

Stone Blue.—Finely powdered indigo mixed with starch paste and made into lumps.

Blue, Stone.—*Syn.* Fig Blue, Thumb Blue, Knob Blue, Crown Blue, Mecklenburg Blue, Queen's Blue.—*Prep.* I. Mix finely powdered indigo with starch paste until a proper color be produced, then make it into small lumps. II. Instead of starch use whiting and a little weak size. Use. Employed by laundresses to give a faint blue tint to linen.

Ultramarine.—A pigment composed chiefly of a costly mineral called lapis lazuli, brought from China and Persia.

Artificial Ultramarine.—A pigment containing sulphide of sodium, obtained by fusing together, in a crucible, porcelain clay, sulphur, and carbonate of soda. French photographic papers are tinted with this villainous alkaline sulphide, which is enough of itself to cause the fading of any photograph.

Blue Verditer.—Nitrate of copper mixed with chalk.

Asphaltum.—A fine rich brown pigment. See Asphaltum.

Bistre.—This water color is prepared from wood soot as follows: The brightest and darkest soot, from the combustion of beech wood, powdered and passed through a silken sieve. The powder is stirred in hot water for 24 hours, and again in another water. The liquors are collected and settled. The precipitate is mixed with gum water, and evaporated in a stove room to the consistency of a solid extract.

Sepia.—The black liquid contained in the cuttle fish. It consists of carbon, along with albumen, gelatine, and phosphate of lime.

Sienna.—An argillaceous mineral found in Italy. By calcination it becomes burnt sienna.

Umber.—A brown mineral found in the island of Cyprus; it is composed of silica, alumina, and oxide of iron and manganese. When calcined for half an hour at a red heat, the pigment called burnt umber is produced.

Umber appears to be a hydrated silicate of iron and manganese, found native in brown lumps, adhesive to the tongue, staining the flesh, and falling to powder in water. The impurities are removed by washing, and the floated article, after settling, forms a light brown powder, which is used raw or burnt. Powdered umber, or that which has been calcined too much, reddens or blackens by the dehydration of the iron, or the superoxidation of the manganese. It is rarely employed alone, but mingles well with other colors and with slaked lime.

Vandyke brown is derived from iron, and is very durable. It is prepared by the calcination of yellow ochers. The resulting frit is sold in lumps, grains, or impalpable powder. A Vandyke brown is also manufactured by calcining sulphate of iron several times. The proper color is arrived at by practice. This latter brown, which is entirely an iron oxide, and of purer color than the preceding, is more expensive. It is often adulterated with the brown frit, a fraud detected by concentrated hot acids, which easily dissolve the pure oxide of iron, and with difficulty the ocher brown. By mixing Vandyke brown with red ocher and manganese binoxide, very durable browns are obtained, which do not require driers when used hot. Other durable browns may be prepared by mixing this pigment with lamp or ivory black.

Gray Pigments.—Ultramarine Ash.—Prepared from the lapis lazuli after the richer blue has been extracted. It is a valuable pale azure gray color, varying somewhat in intensity, but always unvarying in permanence.

Ultramarine ash washes much better than genuine ultramarine, and is very useful in obtaining delicate atmospheric effects.

Green Pigments.—Baryta Green.—Mix 2 parts caustic soda and 1 of potash chlorate; gradually add 2 parts very finely powdered manganese; heat gradually up to dull redness, allow to cool, and powder and exhaust with water; filter, cool add a solution of baryta nitrate to the filtrate. A violet colored baryta precipitate forms; this is carefully washed, dried and treated with ½ to 1 part caustic baryta, hydrated and gradually heated up to redness, with constant stirring. The cooled mass is powdered and finally washed to remove excess of baryta.

Brighton Green.—Separately dissolve 7 lb. copper sulphate and 3 lb. sugar of lead, each in 5 pt. water; mix the solution, stir in 24 lb. whiting and when the mass is dry grind to powder.

Brunswick Green.—1. Pour 3 parts saturated solution sal ammoniac over 2 parts of copper filings, contained in a vessel capable of being closed and keep the mixture in a warm place for some weeks, when the newly formed is separated from the inoxidized copper by washing on a sieve; it is then washed with water and slowly dried in the shade.

2. A solution of crude carbonate of ammonia is added to a mixed solution of alum and blue vitriol as long as it affects it; in a short time the precipitate is collected, washed and dried.

3. Lighter shades are produced by the addition of baryta sulphate or alum.

Bremen Green.—This is properly green verditer, but other preparations are frequently sold under the name.

Casselman's Green.—A fine copper pigment free from arsenic. It consists of basic acetates, combined with more or less water.

Chinese Green (Lo-kao-Vert-Venus.)—A simple green color used by the Chinese. It is capable of being prepared from the buckthorn, and dyes shades which retain their green tone by artificial light and are not very fast. The color is superseded by the aniline dyes.

Chrome, or Guignet's Green.—Fuse together 3 parts boracic acid and 1 part potash bichromate at a dull red heat on the hearth of a flame furnace. This forms a borate of chromium and potash with evolution of oxygen. The mass is repeatedly washed with boiling water, which causes decomposition and consequent separation of hydrated chromium oxide and a soluble potash borate. The oxide is washed and ground very fine.

Cobalt green is obtained by calcination of a mixture of oxides of zinc and cobalt. The first step is to prepare cobalt protoxide free from foreign metals. It is dissolved in 3 parts hydrochloric acid, and the solution is evaporated to dryness. The residue is dissolved again in 6 parts water and a stream of sulphureted hydrogen is passed through the liquor as long as precipitation takes place. The clear liquor, decanted from the sulphides of the foreign metals, is again evaporated to dryness and the residue is dissolved in enough water to make 10 parts.

This liquor is precipitated with soda carbonate, and if, after washing, the still wet precipitate of carbonate of protoxide of cobalt be mixed with zinc white, there is produced a reddish violet magma, which, dried and calcined, constitutes a green mass, the color of which is more intense in proportion as the cobalt solution has been greater.

Copper Green.—Native sub-carbonate of copper.

Douglas' Green.—Barium chromate is precipitated by adding to a solution of barium chloride a sufficiency of a soluble chromate to effect complete separation; to the lemon yellow chromate is added 20% of strong sulphuric acid, which produces a deep red by the liberation of chromic acid; the mass is then ground, and heated to redness, when it becomes green.

Emerald Green.—Form a paste with 1 part verdigris in sufficient boiling water, pass it through a sieve to remove lumps, and gradually add it to a boiling solution of 1 part arsenious acid in 10 parts water, the mixture being constantly stirred until the precipitate becomes a heavy granular powder, when it is filtered through calico, and dried. Emerald green consists of aceto-arsenite of copper prepared by precipitation, and is the most durable of all the greens with a copper base. It is an extremely vivid color, which is durable under exposure to light, but has a tendency to darken in an impure atmosphere.

Where emerald green is required no mixture of blue and yellow will serve as a substitute. It works rather badly, and must not be mixed with any of the yellows of cadmium.

Gellart's Green.—A mixture of cobalt blue and flowers of zinc with some yellow pigment.

Iris Green.—A pigment prepared by grinding the juice of the petals of the blue flag with quicklime. It is very fugitive.

Manganese Green.—Intimately mix 3 to 4 parts caustic baryta moistened with water, 2 parts baryta nitrate, and 2 parts manganese oxide; place in a crucible heated to dull redness, fuse, pour out, pulverize, digest in boiling water, wash in cold water, and dry in an atmosphere free from carbonic acid.

Mitis green is an arseniate of copper, prepared by dissolving 20 parts potassium arseniate in 100 parts hot water, and mixing this solution with another of 20 parts copper sulphate. During the whole operation the mixture is stirred. A pulverulent precipitate of light green or grass green color is formed, and is washed and dried. By varying the proportions several tones and hues are produced; in the commercial article, these are generally due to introduction of foreign substances. The potassium arseniate is prepared by boiling arsenious acid in concentrated nitric acid, filtering, saturating with potassium carbonate, and crystallizing the arseniate.

Mountain Green.—1. Native green carbonate or copper bicarbonate is ground to powder, either with or without addition of a little orpiment or chrome yellow.

2. Add a solution of carbonate of soda or potash to a hot mixed solution of alum and copper sulphate.

Prussian Green.—A mixture of Prussian blue and gamboge.

Sap Green.—The juice of buckthorn berries is extracted by allowing them to ferment in wooden tubs for seven or eight days, and pressing and straining; a little alum is added to the juice, which is evaporated down to a suitable consistence, and run into bladders to dry and harden.

Scheele's Green.—Dissolve 1 part powdered white arsenic and 2 parts commercial potash in 35 parts boiling water; filter, and add the solution gradually, while still warm, to a filtered solution of 2 parts copper sulphate as long as a precipitate falls; wash with warm water, and dry.

Schweinfurth Green.—1. Dissolve 8 lb. arsenious acid in the least possible quantity of boiling water, and add it to 9 to 10 lb. verdigris in water at 120° F. (48½° C.), passed through a sieve; set aside the mixed ingredients till the mutual reaction produces the desired shade.

2. Dissolve 50 lb. copper sulphate and 10 lb. lime in 20 gal. good vinegar, and add a boiling hot solution of 50 lb. white arsenic as quickly as possible; stir several times, allow to subside, collect on filter; dry and powder. The supernatant liquid is employed to dissolve the arsenic for the next lot.

Terra Verte.—Silicate and phosphate of protoxide of iron.

Verdigris is a basic hydrated copper acetate, composed of variable proportions of bibasic and tribasic copper acetates. It is manufactured in France by oxidizing very thin pieces of old sheet copper, heated to 176° F. (80° C.), with a solution of copper acetate, and then immersing them in the skins of pressed grapes, which are in a state of acetic fermentation. After a time, the copper plates are removed from the skins, dried in the air, dipped into water, and again laid in layers of grape skins. When this has been repeated five to seven times, the verdigris is scraped off, kneaded in wooden troughs, and packed in leather bags. Its desiccation is completed in the air. It is also prepared by covering copper plates with vinegar. It is a pure green or bluish green, according to the proportion of sesquibasic acetate it contains. It is highly poisonous, and not durable.

Green Verditer.—An accidental variety of blue verditer.

Vienna Green.—A mixture of arsenious acid and verdigris.

Viridian, or French Veronese Green, differs from the above pigment in being a hydrated instead of an anhydrous sesquioxide of chromium, and in being transparent instead of opaque. It is extremely permanent.

Zinc Green.—Zinc oxide, 5 lb.; cobalt sulphate, 1 lb. Mix with sufficient water to form a paste, and heat to redness, a deep green pigment results. With 10 parts zinc oxide, and 1 part cobalt sulphate, a grass green powder is obtained; and with 20 parts zinc oxide a light grass green pigment is produced, capable of being used instead of arsenic green. This green is permanent in contact with lime (as in mortar, etc.), and has thus an advantage over green made from mixtures of chrome yellow and Prussian blue.—*Elsner.*

Orange Pigments.—Cadmium orange, a variety of sulphide of cadmium introduced in 1862. It is a very brilliant and lustrous pigment, and is much used to replace the old chrome orange, as being not only more permanent, but much more mellow and beautiful in color. It possesses a fair amount of transparency, and is simply invaluable for gorgeous sunsets.

Chrome orange consists of basic chromate of lead. Like all the chromates of lead, it is marked by great power and brilliancy; but also by harshness of color, want of permanence, and a tendency to oxidize delicate organic pigments. It may for most purposes be effectually superseded by cadimum orange. Chrome orange, by reason of its lead base, is discolored by an impure atmosphere.

Orange Lake.—Take of the best Spanish annatto, 4 oz.; pearlash, ¾ lb.; water, 1 gal.; boil it for one-half hour, strain, precipitate with alum, 1 lb.; dissolved in 1 gal. water, observing not to add the latter solution when it ceases to produce an effervescence or a precipitate. The addition of some solution of tin turns this lake a lemon yellow; acids redden it.

Purple.—Purple madder, a lake prepared from the madder plant, is the only durable purple pigment. It is of a maroon purple color, marked by subdued richness rather than by brilliancy, and possessing great transparency. It is extremely useful to the water color painter, as it affords the greatest depth of shadow without coldness of hue.

Cassius Purple.—This is the precipitate which takes place when solutions of gold and tin chloride are mixed under proper conditions. The preparation of the purple of a constant composition is effected by the following process: Gold bichloride is prepared by dissolving 20 grn. gold in 100 of aqua regia, made with 4 hydrochloric acid and 1 of nitric acid. The solution is evaporated to dryness in a water bath, in order to expel the excess of acid, and the remaining gold chloride is dissolved in 75 grn. water. Pure granulated tin is then introduced into the filtered liquor, which after some time becomes brown and turbid. After standing several days, all the gold is in the state of stannate of protoxide, which is separated from the remainder of the metallic tin. The product is collected upon a paper filter, carefully washed and dried at a gentle heat.

Reds.—Brazil Wood Lake.—(*a*) Digest 1 lb. ground Brazil wood in 4 gal. water for twenty-four hours, boil one half hour, and add 1½ lb. alum dissolved in a little water; mix, decant, strain; add ½ lb. tin solution, again mix well and filter; to the clear liquid cautiously add a solution of soda carbonate while a precipitate forms, avoiding excess; collect, wash and dry. The shade will vary according as the precipitate is collected. (*b*) Add washed and recently precipitated alumina to a strong filtered decoction of Brazil wood.

German Carmine.—Cochineal, 1½ lb.; water, 10½ gal. After boiling five minutes add 1½ oz. alum. Let the mixture boil five minutes longer, filter and set away in glass vessels for three or four days. Decant, and dry the carmine in a shady place. The remaining liquid will deposit an inferior quality of carmine by standing.

Carminated Lake.—(*a*) The cochineal residue left in making carmine is boiled with repeated portions of water till exhausted; the liquor is mixed with that decanted off the carmine, and at once filtered; some recently precipitated alumina is added, and the whole is gently heated and well agitated for a short time; as soon as the alumina has absorbed enough color, the mixture is allowed to settle, the clear portion is decanted, and the lake is collected on a filter, washed and dried. The decanted liquor, if still colored, is treated with fresh alumina till exhausted, and thus a lake of second quality is obtained. (*b*) To the colored liquor obtained from the carmine and cochineal, as just stated, a solution of alum is added, the filtered liquor is precipitated with a solution of potash carbonate, and the lake is collected and treated as before. The color is brightened by addition of tin solution.

Carmine.—Boil 1 lb. cochineal and 4 drm. potash carbonate in 7½ gal. water for one quarter hour. Remove from the fire, stir in 8 drm. powdered alum, and allow to settle for twenty to thirty minutes. Pour the liquid into another vessel, and mix in a strained solution of 4 drm. isinglass in 1 pint water; when a skin has formed upon the surface, remove from the fire, stir rapidly and allow to settle for one half hour, when the deposited carmine is carefully collected drained and dried.

Carmine.—The finest portion of the coloring matter of cochineal freed as far from possible from impurities. It is sometimes used in the pigment style of printing.

Red Chalk (Clay Iron Ore).—Cobalt pink is a mixture of the oxide of this metal with magnesia. It is durable, and more or less pink according to the proportion of cobalt. It is an expensive pigment, used only for fine painting. Its preparation consists in making a paste of carbonate of magnesia with a concentrated solution of cobalt nitrate. The paste is dried in a stove, and then calcined in a porcelain crucible.

Cochineal Lake.—1. Digest 1 oz. coarsely powdered cochineal in 2½ oz. each water and rectified alcohol for a week; filter and precipitate by adding a few drops of tin solution every two hours, till the whole of the coloring matter is thrown down; wash the precipitate in distilled water and dry.

2. Digest powdered cochineal in ammonia water for a week; dilute with a little water and add the liquid to a solution of alum as long as any precipitate (lake) falls.

3. Boil 1 lb. coarsely powdered cochineal in 2 gal. water for one hour; decant, strain, add solution of 1 lb. cream of tartar, and precipitate with solution of alum. By adding the alum first and precipitating the lake with the tartar, the color is slightly changed.

Crimson Lake is precisely similar to carmine in origin, and differs from it in containing a larger quantity of base and a correspondingly smaller amount of coloring matter. It is far more generally useful than carmine, washes better, and is not so scarlet in hue.

Indian Red.—1. Iron sulphate is calcined until the water of crystallization is expelled, then roasted by a fierce fire until acid vapors cease to arise, cooled, washed with water till the latter has no acid reaction, and dried.

2. Calcine, 11 parts; common salt with 25 parts green iron sulphate; well wash with water, dry, and powder.

3. The finest Indian red, or crocus, usually undergoes a second calcination at a higher temperature.

Madder Lake.—1. Tie 2 oz. madder in a cloth, beat it well in 1 pt. water in a stone mortar, and repeat the process with about 5 pt fresh water till it ceases to yield color; boil the mixed liquor in an earthen vessel, pour into a large basin, and add 1 oz. alum dissolved in 1 pt. boiling water; stir well, and gradually pour in 1½ oz. strong solution of potash carbonate; let stand until cold, pour off the yellow liquor from the top, drain, agitate the residue repeatedly in 1 qt. boiling water, decant, drain, and dry.

2. Add a little solution of lead acetate to a decoction of madder, to throw down the brown coloring matter; filter, add solution of tin or alum, precipitate with solution of soda or potash carbonate, and proceed as before.

3. Macerate 2 lb. ground madder in 1 gal. water for 10 minutes; strain and press quite dry; repeat a second and third time, and add to the mixed liquors ½ lb. alum dissolved in 3 qt. water; heat in water bath for three to four hours, adding water as it evaporates; filter first through flannel, and when cold enough through paper; add solution of soda carbonate as long as precipitate falls; wash the latter till the water comes off colorless and dry.

Orange Red.—Sandix. White lead calcined.

Red Lead.—Minium. Litharge (oxide of lead) roasted in a reverberatory furnace.

Venetian Red.—Oxide of iron.

Vermilion.—Cinnabar. Protosulphide of mercury.

Vermilion.—Take some hot glue water and a few drops concentrated extract of saffron. Color with carmine, to any desired color.

Stained Glass Pigments.—These colors are very difficult to produce in the desired shade and should not be attempted by the amateur. They may be purchased in all shades, and the results are much more reliable.

White Pigments.—Alum White.—Powdered Roman alum, 2 lb.; honey, 1 lb.; mix dry, powder, calcine in a shallow dish to whiteness, cool, wash and dry. A beautiful and permanent white, both in oil and water.

Whites.—Alum White.—Dry, mix 2 lb. powdered alum, 1 lb. honey; powder, calcine to whiteness in a shallow dish, cool, wash and dry.

Baryta White.—Natural baryta sulphate; barytes or heavy spar is employed in the manufacture of a handsome innocuous white color, fast and resisting most reagents, but with little body or covering power. This white, fixed with glue size, is largely employed in the manufacture of paper hangings, and for adulter-

ating white lead and zinc white. In preparing it the whitest lumps are picked out, coarsely broken and heated in reverberatory furnaces to disintegrate the substance and produce a finer degree of pulverization. The grinding is done dry, and the resulting fine powder is thrown into tanks of water, stirred and let stand a little while, when the heavier and coarser particles fall to the bottom. The milky looking supernatant water is decanted into settling basins where the lighter suspended material deposits; after another decantation of the clear liquor, the pasty white is collected and dried in the air or a stove room.

Chinese White.—1. Mix finely ground zinc white to a cream with mucilage of gum tragacanth, grinding with a glass muller.

2. Take as much as is required of zinc white finely ground, put it on a marble or glass slab, mix into a cream of the required consistence by adding mucilage of gum tragacanth, grinding with a glass muller. For quantity required to fill an ordinary sized Chinese white bottle, add to above 10 or 12 drops of thick mucilage of gum arabic and 5 or 6 drops of pure glycerine; grind well together and fill bottle by aid of palette knife. Make tragacanth mucilage by putting a small piece, size of a horse bean, into 2 oz. of cold water, letting it remain a day or two until gum swells up and absorbs water, then beat into a pulp. It will easily regrind when dry with a little fresh medium. As required consistence depends much on habit and practice, we do not specify any exact proportions. It is easy to add white or medium to suit taste. The cost when thus made is very trifling.

Constant White, also called permanent white, ranks as a white water color pigment second to Chinese white. It consists of sulphate of barium prepared by a process of precipitation, and is one of the most absolutely unchangeable substances with which chemists are acquainted. Like most pigments which are supereminent in respect of permanence, it possesses great artistic drawbacks; a fatal lack of body, a very unpleasant manner of working and finally a habit of drying several tones higher than when wet, and thus subjecting even an experienced artist to considerable uncertainty when he uses it in compound tints. Constant white should be carefully tested before use to make sure that the last traces of the sulphuric acid employed in its manufacture have been washed away.

Derbyshire White.—From chalk or heavy spar, by grinding and elutriation.

Whiting.—Spanish white and Paris white are practically the same article in different degrees of fineness, all being simply chalk, ground, elutriated, balled and dried. Grinding mills break up the chalk and mix it with water, which is constantly flowing in. On leaving the mills the mixture passes along a series of wooden troughs, where the sand, which has a greater specific gravity than the chalk, is deposited, the chalk passing on into the settling pits. On being taken from the pits, the whiting is partially dried on a floor under which hot flues run; then cut up into large rough lumps and placed in racks on cars which run round on tramways into an immense oven. The heat from the flues in this oven is greatly increased by an air blast, which also carries off the moist exhalations from the drying whiting; twelve hours on the heated floor and twelve in the oven thoroughly dries the whiting and it is ready for packing or the putty factory. Paris white of fine quality is used for finishing parlor walls, adulterating paints, making paper heavier and whiter, etc. For this purpose what is called cliff stone, a better and harder quality of chalk, is used. Paris white is made much on the same principle as whiting, only more carefully washed and more slowly dried.

Whiting.—The same as prepared chalk, but prepared more carelessly, in horse mills.

Wilkinson's White.—Litharge is ground with sea water till it ceases to whiten and is then washed and dried.

Zinc White.—1. Zinc chloride or sulphate is precipitated by means of a soluble sulphide — sodium, barium and calcium sulphides have been used—and precautions are taken that no iron present is precipitated. The precipitate is collected, dried and calcined for some time at cherry red heat, with careful stirring. It is raked out while hot into vats of cold water, then levigated and dried. It is zinc oxysulphide.—*Griffiths.*

2. A white pigment, said to possess excellent covering properties, is prepared by bringing together barium sulphide and zinc sulphate in solution and subjecting the precipitate which ensues (a mixture of zinc sulphide and baryta sulphate) to the action of superheated steam, by which, at white heat, all the zinc sulphide will be converted into zinc oxide.—*Meissner.*

3. Crude barium sulphide is lixiviated. The supernatant liquid is drawn off and divided into equal portions. To one, an equivalent of zinc chloride is added, and to this again zinc sulphate, and afterward another portion of barium sulphide, the result being an intimate mixture of 1 equivalent of barium sulphate and 2 of zinc sulphide. The precipitates, composed of zinc and barium, are collected, pressed to expedite drying, placed in a retort, and brought to a red heat. While still hot, they are drawn into water, preferably cold, which, it seems, has the effect of increasing their density and imparting body to the paint to be made from them. They are subsequently washed and ground in water to fine powder, or first dried and then ground. By increasing the number of additions of zinc sulphate, the quality may be varied. The pigment thus prepared is used in the ordinary way.—*Orr.*

4. Zinc dust, containing lead, silver, copper, and other impurities is allowed to digest in leaden vessels filled with a concentrated solution of ammonium carbonate in ammonia water.

Zinc White.—Oxide of zinc.

Mineral White. — Precipitated carbonate of lead.

Newcastle White. — White lead made with molasses vinegar.

Nottingham White.—White lead made with alegar. Permanent white is now commonly sold for it.

Pearl White.—Fard's Spanish White. Trinitrate of bismuth.

Permanent White. — Artificial sulphate of baryta, prepared by precipitating chloride of barium with dilute sulphuric acid, or a solution of Glauber salts. A good fast white unchanged by sulphurous fumes. Used to mark jars and bottles for containing acids or alkalies, as it is affected by very few substances; also to adulterate white lead.

Permanent White.—Carbonate of baryta.

Snow White.—Oxide of zinc obtained by the combustion of the metallic vapors of zinc in atmospheric air. The heavy portion is called zinc white; the light snow white.

White Lead.—Basic carbonate of lead.

Dutch White Lead.—1. From flake white, 1 cwt.; chalk, 3 cwt.

2. Ordinary.—Flake white, 1 cwt.; chalk, 7 cwt. These form the best white lead in the shops.

2. English White Lead.—Flake white lowered with chalk; covers badly, and the color is inferior to the preceding.

French White Lead.—From litharge dissolved in vinegar and the lead thrown down by a current of carbonic acid gas from coke. Does not cover so well as flake white.

Hamburg White.—From flake white, 1 cwt.; chalk, 2 cwt. Also sold for best Dutch white lead.

Spanish White.—After picking out the coarser

impurities, the chalk is ground in a mill and formed into rolls, in which shape it is found in the trade. For painting purposes, it is still further purified by stirring in clear water, allowing it to settle, and decanting the first water, which is generally yellow and dirty. The washing is repeated, and the chalk is floated out into another vessel, after passing through a silken sieve. After settling, the water is decanted, and the pasty white residue is formed into cylindrical rolls, 3 to 4 in. long, and 1½ to 2 in. diameter. These are allowed to harden and dry in the air, and are then ready for painting, whitewashing ceilings, and for distemper painting with size.

Lead Sulphate.—Precipitate the pigment by adding diluted sulphuric acid to an acetic or nitric acid solution of litharge; wash and dry.

Sulphate of Lead.—From an acetic or nitric solution of litharge precipitated by adding dilute sulphuric acid, and the white powder washed and dried. The clear liquid decanted from the precipitate is poured on fresh litharge, when a second solution takes place; this may be repeated for any number of times.

To find if white lead has been adultetated by permanent white or sulphate of baryta—the commonest adulterant—the admixture may be recognized by boiling a small quantity of it in a glass test tube with nitric acid diluted with an equal measure of water. The white lead dissolves, but the baryta remains as a white residue. This should be allowed to settle, the clear liquid poured off, and the deposit again treated with nitric acid and then boiled with water.

Yellow Pigments.—Brass Color, Brass Pigment, Bronze.—Grind copper filings or the precipitated powder of copper, with a little red ocher, red colored.

2. Gold colored brass or Dutch leaf reduced to a very fine powder. Yellow or gold colored.

Before application these powders are mixed up with pale varnish, no more being worked up than is wanted for immediate use. They are also applied for dusting them over any surface, previously covered with varnish, to make them adhere.

Cadmium Yellow.—Pass a stream of sulphureted hydrogen through cadmium sulphate. The precipitate is washed and dried.

Pale Cadmium Yellow.—There are two varieties of pale cadmium in the market, one a full yellow and the other far more lemon in hue; and they have very different qualifications in respect of permanence. The first named variety is quite as permanent as the deep cadmium yellow above. The latter, although varying considerably in durability, according to the method of manufacture, sooner or later fades away under the action of ordinary light.

Yellow Carmine.—The first of a series of three lakes prepared by precipitating the coloring matter of quercitron bark in combination with alumina. It is sometimes sold under the name of yellow madder, and has thus acquired a kind of presumptive permanence which is utterly misleading.

Cassel Yellow.—A yellow pigment, the oxychloride of lead, known also as *mineral yellow*, or Turner's patent yellow.

Yellows.—Chrome yellow.—1. Add a filtered solution of lead nitrate or acetate to a filtered solution of neutral potash chromate so long as a precipitate falls; collect this, wash with soft water and dry in security from sulphur tainted air.

2. Dissolve lead acetate in warm water, and add sufficient sulphuric acid to convert it into sulphate; decant the clear liquid, wash the residue with soft water, and digest with agitation in a hot solution of yellow (neutral) potash chromate, containing 1 part of this salt for every 3 parts lead sulphate; decant the liquid, and drain, wash and dry the precipitate.

3. Half to 2½ equivalents (according to color required) sulphuric or phosphoric acid is added to a solution of potash bichromate in water. This mixture is added to a milk of white lead or litharge (very finely divided and suspended in water), the addition being in the form of a thin stream, to prevent undue heating. The required coloring matter falls.—*Werner.*

Cologne Yellow.—Sulphate of lime, 60%; lead sulphate, 15%; lead chromate, 25%.

Pink, Dutch.—*Prep.* French berries, 1 lb.; turmeric, ½ lb.; alum, ½ lb.; water, 1½ gal. Boil ½ an hour, strain, evaporate to 2 qt., add *whiting*, 3 lb., and dry by a gentle heat. Starch or white lead is sometimes employed instead of whiting, to give it a body. Golden yellow. Used as a pigment.

Indian Yellow.—A concretion formed in the intestines of the camel.

King's Yellow, sometimes termed orpiment, is an artificially prepared sesquisulphide of arsenic, and usually contains an appreciable quantity of free arsenious acid. It is a bright yellow pigment, in hue about midway between aureolin and lemon yellow, and with so many bad qualities that it is rapidly falling into disuse.

Yellow Lakes.—1. Boil 1 lb. Persian berries, quercitron bark, or turmeric, and 1 oz. cream of tartar in 1 gal. water till reduced to half; strain the decoction, and precipitate by solution of alum.

2. Boil 1 lb. of the dyestuff with ½ lb. alum in 1 gal. water, and precipitate by solution of potash carbonate.

3. Boil 4 oz. annatto and 12 oz. pearlash in 1 gal. water for half an hour; strain, precipitate by adding 1 lb. alum dissolved in 1 gal. water till it ceases to produce effervescence or a precipitate; strain and dry.

Lemon Yellow.—The genuine and only permanent lemon yellow is a peculiar preparation of chromate of barium, It is a very beautiful semi-opaque lemon, inclining to primrose, and possessing great purity and clearness of color, although not very remarkable for intensity.

Nankin Yellow.—Dry and calcine a mixture of lead nitrate, concentrated solution, and powdered peat.

Naples Yellow.—1. Mix 3 lb. powdered metallic antimony, 1 lb. oxide of zinc and 2 lb. red lead; calcine, grind fine and fuse in a closed crucible; grind the fused mass to fine powder and wash well.

2. Grind 1 part washed antimony with 2 parts red lead to a stiff paste with water, and expose to red heat for four to five hours.

Ochers.—Native oxides of iron mixed with argillaceous and calcareous earths.

Orpiment.—Orpiment (arsenic trisulphide) is a lemon or orange yellow colored substance, found native in Hungary, the Hartz, and other places; the finest samples used by artists (golden orpiment) come from Persia. The commercial article is artificially prepared for use as a pigment in the following way: A mixture of arsenious acid and sulphur is placed in an iron subliming pot, similar to those used in the preparation of crude white arsenic. The mixture is heated until the sublimate, which immediately forms upon the rings fixed above the pot, begins to melt. The proportions of the two ingredients used vary largely, the best colors being probably produced when the mixture contains ⅓ to ½ of sulphur; for the lighter colors a smaller proportion of sulphur is employed. Orpiment made in this manner consists of a mechanical mixture of arsenic sulphide and oxide. The native sulphide is preferred to the artificial by artists and dyers, by reason of its richer color.

Patent Yellow.—Litharge, 320 lb.; common salt, 80 lb.; grind, with water. Keep this mixture for some time in a moderate heat. Add water to supply loss from evaporation. Wash out the carbonate of soda; heat what remains until it assumes a fine yellow color.

Queen's Yellow.—Turpith mineral, or subsulphate of mercury.

Realgar.—Realgar (arsenic disulphide) is a deep orange red substance, soluble in water, and highly volatile and poisonous. It is found native in some volcanic districts, especially in the neighborhood of Naples, but the commercial article is made by distilling in earthenware retorts, arsenical pyrites, or a mixture of sulphur and arsenic, or of orpiment and sulphur, or of arsenious acid, sulphur, and charcoal; it has not the brilliant color of the native mineral, and is much more poisonous. On a large scale, the manufacture is carried on in the following way: The ingredients are mixed in such proportions that the mixture shall contain 15 per cent. arsenic and 26 to 28 per cent. sulphur, in order to make allowence for the volatilization of a portion of the latter. The mixture is then placed in earthenware retorts, which are charged every twelve hours with about 60 lb.; this quantity should fill them ¾ full. These are gradually heated to redness for eight to twelve hours, during which time the realgar distills off, and is collected in earthen receivers, similar to the retorts, but perforated with small holes to permit the escape of these gases. After the operation, the receivers are emptied and the crude product is remelted. This is performed in cast iron pots, the contents being well agitated, and the slag carefully removed. The requisite amount of sulphur or arsenic is added, according to the color of the mixture, or a proper quantity of realgar containing an excess of the required constituent, and the mass is again stirred. When, on cooling, it exhibits the correct color and compactness, it is run off into conical moulds of sheet iron, cooled, and broken up; it is sometimes refined by resublimation.

Dr. Pierce's Golden Medical Discovery.—A $1 bottle holds 220 grn. of a brownish colored clear liquid, consisting of 15 grn. pure honey, 1 grn. extract of poisonous or acrid lettuce (bot. *herba lactucæ virosæ*), 2 grn. laudanum, 100 grn. dilute alcohol (64%), tasting like fusel oil and wood spirit, with 105 grn. of water.—*Hagar.*

Pills.—The pill form has many advantages for the administration of medicines, and is deservedly popular. There are many substances the taste of which can in no other way be so readily disguised, and, when the pill mass is properly prepared, there is no other manner in which accurcy of dose can be better secured. If the substance to be made into pills be a solid extract, add a few drops of water, and rub it to the proper consistence; if it be a resin, add alcohol; if it be a soft or liquid substance, rub up with some inert substance, as crumb of bread, or wheat flour, or starch, or pulverized gum arabic; if it be a powder, mix with some soft substance, as confection, soap, or sirup, or mucilage of gum arabic. The materials must be mixed thoroughly and rubbed into a uniform mass, and then rolled with a spatula or case knife, into a cylinder of equal size throughout. This is then to be divided equally into the number of pills required, each of which is rolled into spherical form between the thumb and finger. If the number of pills is large, a mortar or slab should be used for mixing the ingredients, and a pill machine for making the pills.

The most popular form of pill is the sugar or gelatine coated. In this manner all taste of the ingredients which are used can be entirely disguised.

Brandreth's Pills, says Dr. Hagar, consist of gamboge (*gummi resinæ guttæ*), podophyllin, inspissated juice of phytolacca, saffron adulterated with yellow root, pulverized cloves and oil of peppermint. The editor states in a foot note that, according to the assertion of two American druggists and one merchant, gamboge is present in Brandreth's pills, but that the action of the pills does not correspond to this constituent, in which latter assertion we think the editor is slightly mistaken, the pill being really cathartic.

Cholera Pills.—A writer in *El Pabellon Medico* maintains that opium is as successful in cholera as quinine is in ague, and that it should be given in doses proportioned to the gravity of the case. He therefore has recourse to full doses of opium frequently repeated.

The following formula for cholera pills is that of M. Bourgone:

Tannate of quinia	1	grm.
Powdered opium	5	centgr.
Essence aniseed	2	drp.
Simple sirup, to make	10	pills.

which may be taken in the course of one or two hours.

Pills, Diuretic.—Prep. (Thomson.)—A. Powdered digitalis, 12 grn.; calomel and opium, of each, 4 grn.; confection of roses, q. s. for 12 pills. B. Mercurial pill, 1 drm.; powdered squills, 1 scr.; confection of roses, q. s. for 20 pills. *Dose*, 1 of either of the above twice a day in dropsy.

Podophyllin Pills. (Castor Oil Pills.)—

Resin podophylli	3	grn.
Extr. hyoscyami	3	grn.
Saponis	4½	grn.
Syrupi	6	drop.

M. Make 12 pills.

Pills, to Silver.—Pills are gilded and silvered by rolling them between the fingers slightly moistened with mucilage, and then shaking them up in a small gallipot covered with a piece of paper, along with a little gold or silver leaf, or a little powdered gold or silver.

Sulphur Pills.—

Potassii sulphureti	1	drm.
Pulveris jalapæ	1	drm.
Saponis	1	drm.
Extr. taraxaci	q. s.	

Make 120 pills.

Pink Pigments. See **Pigments.** (*Red*).

Pin Wheels. See **Pyrotechny.**

Pipe Clay.—A natural deposit of an unctuous clay, which burns white.

Pipes.—The capacity of pipes is as the square of their diameters. If you double the diameter of a pipe, you increase its capacity four times.

Pipes, Cements for. See **Cements.**

Pipes, New Method of Testing Large.—The usual practice has been to close the ends by caps and then force in water until the pipe was completed filled; but with large pipes, very strong caps were required, and there was a waste of time and of water, thus largely increasing the expense. The new plan is simply to place within the pipe a core, of nearly as great a diameter as the pipe itself, and then force in water enough merely to fill the space between the two.

Pirsch-Baudoin's Alloy. See **Alloys.**

Pistachio for Dispensing.—To ½ gal. sirup add ½ oz. extract pistachio, ¼ oz. essence bitter almond. Condensed milk should be added for dispensing.

Pitch, Brewers'.—Light Yellow.—Pine pitch, 150 parts; add 7½ to 9 lb. of caustic soda lye of 10° B. Melt in an open iron boiler, when bubbles cease to form, pour the pitch into moulds.

Pitch, Brewers'.—*Brown.*—

1. Pine pitch	120	lb.
Red transparent rosin	102	lb.
Rectified heavy rosin oil	12	lb.
2. Pine pitch	37½	lb.
Red transparent rosin	70	lb.
Rectified heavy rosin	6	lb.
3. Pine pitch	44	lb.
Brown rosin	176	lb.
Rectified heavy rosin	11	lb.

Pitch, Burgundy.—1. Impure resin prepared from the turpentine of the Norway spruce fir.

2. Imitation of.—Melt common resin with linseed oil and color the mass with annatto or palm oil.

3. Melt 100 lb. good yellow resin with linseed oil, 1 gal.; palm oil, bright, q. s. to color. The mixture is allowed to partially cool, when it is pulled with the hands. It is usually sold in bladders.

Pitch, Canada.—Pitch from the hemlock spruce fir.

Pitch.—A dry bitumen distilled; prepared from liquid pitch.

Chasing Pitch.—Use a mixture of 1 part beeswax with two parts rosin, with sufficient sweet oil to soften the composition to fancy.

Pitchers.—Term used in keramics, applied to baked ware finely pulverized.

Plants, Alimentary Solution for.—

Potassium nitrate	10 grm.
Calcium carbonate	5 grm.
Sodium chlorate	5 grm.
Calcium phosphate	5 grm.
Sodium silicate	5 grm.
Ferrous sulphate	1·5 grm.
Water	100 lit.

Plants, to Preserve the Natural Colors of.—A recent improved receipt for preserving plants with their natural colors is to dissolve 1 pt. salicylic acid in 600 parts alcohol, heat the solution up to boiling point in an evaporating vessel and draw the plants slowly through it. Shake them to get rid of any superfluous moisture and then dry between sheets of blotting paper under pressure in the ordinary manner. Too prolonged immersion discolors violet flowers, and in all cases the blotting paper must be frequently renewed. The novelty appears to be the salicylic acid.—*Art Amateur.*

Plaster of Paris.—This very useful material is made by calcining calcium sulphate (gypsum) at a temperature of 500° F., by which all the water of crystallization is expelled. It is of the greatest use, especially in the formation of casts or moulds.

Plaster, to Bronze. See **Bronzing.**

Plaster Casting.—The polish on plaster figures is said to be produced by immersion in melted paraffine or wax, and rubbing smooth. A prize for such a process was offered by some society in Berlin.

Plaster Casts, to Harden.—A few coats of a hot and saturated solution of borax, alum, or similar substances are applied with a brush until the surface has the desired hardness. Two coats will generally answer, but occasionally as many as five or six may be necessary. A few (generally two) coats of a hot saturated solution of chloride of barium and a few coats of soap water are then applied with a brush, and the surplus soap is washed off until the clear water forms beads on the surface of the cast.

These operations can be performed in a few hours and produce a hard surface consisting of substances insoluble in water and which will prevent the appearance of yellow spots, for the neutral salts that have been employed will prevent any action of the gypsum on the iron contained in the same. Different neutral salts may be used, and the operations may be performed in the reverse order. Instead of chloride of barium, other barium, strontium, or calcium salts, that will produce an insoluble precipitate and will not produce oxide of iron, may be used.—*Dr. Von Decheudin, Bonn.*

The following process is noted from France for hardening plaster, so that it may be used for flooring, as wood and tile are at present. About 6 parts of good quality plaster are intimately mixed with 1 part of freshly slaked white lime finely sifted. This mixture is then laid down as quickly as possible, care being taken that the trowel is not used on it for too long a time. The floor should then be allowed to become very dry, and afterward be thoroughly saturated with sulphate of iron or zinc—the iron giving the strongest surface, the resistance to breaking being twenty times the strength of ordinary plaster. With sulphate of zinc the floor remains white, but when iron is used it becomes the color of rusted iron; but if linseed oil, boiled with litharge, be applied to the surface, it becomes of a beautiful mahogany color. Especially is this the case if a coat of copal varnish be added.

To Make Plaster Casts Hard.—To a thin milk of lime, or lime water add 10 or 15 drops of liquid silicate of soda for every pint of fluid used; this is then thickened with plaster to a thick cream. Plaster thus prepared will set in five minutes or thereabout, according to the thickness of the cream. If too much silicate is used, the soda will effervesce on the surface, and spoil the sharpnesss of the impression.

Plaster Casting from Life.—Casting from life is very unpleasant for the person operated upon, and especially when the face is moulded, the pain is considerable. The face is first greased well with vaseline, the eyelashes and eyebrows being well buried in pomade or clay and the small hairs well smoothed down. Whiskers, etc., should be well coated with clay. Quills are inserted in the nostrils for respiration. Then when the patient is lying in a recumbent position, the plaster is laid on. The patient must not move or laugh or speak until the plaster is set. The plaster is mixed with warm water, as the plaster sets better than with cold water. When the cast is sufficiently set, it is removed. This is the painful part of the operation. A hand can be done by thrusting it in a basin of plaster, then placing it on a towel in desired position. As the plaster sets, lay a strong thread on the wet plaster along the hand down the middle finger. A second thread may be laid from the wrist to the thumb. The object of these threads is to make divisions in the mould, and thus enable the hand to be withdrawn. Now lay on the plaster over the whole to a sufficient thickness. When it is nearly set (still soft and wet), take the ends of the threads, and by jerking them sharply through the plaster, sections are made in the mould. In a few minutes the plaster is hard and the mould may be burst asunder at the divisions cut by the thread and the hand released. Fractures which will probably occur in thin parts of the mould must be cemented carefully in their places after they are dry by a solution of shellac in alcohol. Limbs and even the entire figure can be moulded in this manner. Professional moulders should be employed in taking casts of deceased persons.

Plaster of Paris, to Cast.—In the first place use the finest and purest plaster of Paris obtainable. When filling a mould, learn to beat up the requisite quantity of cream quickly, and with care to avoid making it too thick. In pouring this in, use a good camel's hair brush to displace air bubbles; a mere surface cover of this thin cream is all that is requisite. While doing this have ready the thicker plaster, of the consistence of light sirup, and fill up the mould at once. In about twenty minutes you can open the mould, if your plaster is pure and has been properly mixed. If you do not put too much oil on the object to be moulded, and have used your brush properly, you will find clear, sharp moulds.

Substitute for Plaster of Paris.—Best whiting, 5 lb.; glue, 2½ lb.; linseed oil, 2½ lb. Heat these materials, and mix them thoroughly. After this compound has cooled, lay on a stone which is covered with powdered whitening, heat until the mass is tough and firm. Cover with wet cloths to keep moist. Ornaments may be made of this material by pressing it

into a mould, with a screw press. It becomes very hard after a time.

To Render Plaster Figures Durable.—Thoroughly dry the plaster figure; cover with the best linseed oil, just warm; take out in twelve hours and dry in a place free from dust. The figure looks like wax when dry, and can be washed without injury.

To Harden Plaster.—Mix the plaster of Paris with a weak solution of gum arabic (½ oz. to ½ pt. of water) or for common uses with a weak solution of size. This not only makes the plaster hard but gives smoothness to the surface.

Plaster Work, to Harden.—Glycerine is said to be a good coating for the interior, but lard and oil is most commonly used. Plaster casts immersed in a hot solution of glue long enough to be well saturated, will bear a nail driven in without cracking.

Plaster Models, to Mend.—Sandarac varnish is the best material for mending plaster models. Saturate the broken surfaces thoroughly, press them well together and allow them to dry.

Plaster of Paris, to Silver. See **Silvering.**

Plastering, Interior. — *Substance.* Mortars which are used for interior work are called fine, coarse, gauge and stucco.

Fine Stuff.—Lump lime is to be slaked with water to a paste and afterward to a cream, after which it hardens by the water evaporating and is ready for working. It is now used for what is termed slipped coat, but is ready for finishing coat when prepared with plaster of Paris or sand.

Coarse Stuff.—Lime paste, 2 parts; sand, 4¼ parts; hair, ½ part. There may be less hair used for the second coat.

Gauge Stuff or Hard Finish.—This is composed of from 1½ to 2 parts fine stuff and ½ plaster of Paris. Regulation must be considered as to the rapidity of hardening. For cornices, etc., there will be equal parts fine stuff and plaster.

Plasters.—Plasters are external applications that possess sufficient consistence not to adhere to the fingers when cold, but which become soft and adhesive at the temperature of the human body. They are chiefly composed of unctuous substances united to metallic oxides, or powders, or to wax or rosin. Plasters are usually formed while warm into ½ lb. rolls about 8 or 9 in. long and wrapped in paper.

Plasters, Composition for.—Ninety parts Burgundy or Canada pitch are mixed with 10 parts yellow wax and melted together. Glue mixed with glycerine equal to one-tenth the weight of the dry glue may be used.

Plaster, Court.—1. Soak isinglass in a little warm water for seventy-four hours, then evaporate nearly all the water by gentle heat, dissolve the residue in a little proof alcohol, and strain the whole through a piece of open linen. The strained mass should be a stiff jelly when cool. Now stretch a piece of silk or sarsanet on a wooden frame, and fix it tight with tacks or packthread. Melt the jelly, and apply it to the silk thinly and evenly, with a badger hair brush. A second coating must be applied when the first has dried. When both are dry, apply over the whole surface two or three coatings of balsam of Peru. Plaster thus made is said to be very pliable and never breaks.

2. Court plaster should be thoroughly soaked on both sides before it is applied, and should be pressed on with a soft, dry cloth. Then it will adhere so firmly that washing with soap and water will hardly remove it.

3. *a.* Black silk or sarsenet is strained and brushed over ten or twelve times with the following composition: Balsam (gum) of benzoin, ½ oz.; 90% alcohol, 6 oz.; dissolve. In a separate vessel dissolve 1 oz. isinglass in as little water as possible; strain each solution, mix, and decant the clear. It is applied warm. When the last coat is quite dry, a finishing coat must be given with a solution of 4 oz. Chio turpentine in 6 oz. tincture of benzoin. *b.* Isinglass, 1 oz.; dissolve in proof spirit, 12 oz.; add tincture of benzoin, 2 oz.; give 5 or 6 coats, and finish off as last. *c.* Isinglass, 1 oz.; water, 3 oz.; dissolve, add tincture of benzoin, 1 oz.; apply as above, and finish off with a coat of tincture of benzoin or tincture of balsam of Peru. Goldbeater's skin is now frequently substituted for sarsenet.

Plaster, Sticking.—Adhesive plaster.—

Litharge	5 oz.
Olive oil	12 oz.
Water	8 oz.

Put the water and litharge into a copper pan. Mix together with a spatula; add the oil, and boil, stirring constantly. This process takes from 4 to 5 hours, but it can be hastened to 20 or 30 minutes by adding 1 oz. of colorless vinegar. To make resin or strapping plaster, used in retaining the lips of recent cuts and wounds in contact: Mix by a moderate heat 1 oz. of resin to 5 oz. of litharge plaster (as given above) and spread upon muslin.

Plate Powders. See **Polishing.**

Plating. See **Electro-Metallurgy.**

Platinizing Metals, Cheap Method of.—In this new process, the metallic object is covered with a mixture of borate of lead, oxide of copper, and spirits of turpentine, and submitted to a temperature of from 250° to 330°. This deposit, upon melting, spreads in a uniform layer over the object. Then a second coat is laid on, consisting of borate of lead, oxide of copper, and oil of lavender. Next, by means of a brush, the object is covered with a solution of chloride of platinum, which is finally evaporated at a temperature of not more than 200°.

The platinum adheres firmly to the surface, and exhibits a brilliant aspect. If the deposit be made upon the first coat, the platinum will have a dead appearance. Platinizing in this way costs, it is said, about one-tenth the price of nickel plating —*Le Genie Civil.*

Platinizing Copper.—The appearance of platinum may be given to copper by immersion in a bath composed of 1¾ pt. hydrochloric acid, 7½ oz. arsenic acid, and 1¼ oz. acetate of copper. The article must be cleaned before immersion, and left in the bath till it has the color of platinum.

Platinizing Silver.—Place some platinum in a small quantity of aqua regia or nitro-muriatic acid, and keep it in a warm place a few days; it will dissolve. As soon as it has dissolved, evaporate the liquid at a gentle heat until it is as thick as honey, so as to get rid of the excess of the nitric and muriatic acids. Add a little water, and it is ready for use. A dozen drops of this solution goes a long way in platinizing silver. The operation is performed in a small glass or beaker, covered with a watch-glass to keep in the fumes, and placed in a little sand in a saucer, to equalize the heat.

Platinum, to Solder. See **Soldering.**

Plush, to Renovate. See **Cleansing.**

Poisons, Antidotes for.—Many serious accidents, says the *Moniteur des Produits Chimiques*, happen, or may happen, in consequence of a loss of time in the application of remedies in the case of absorption of, or burning by, such poisonous chemical products as are commonly employed in the industries. The following antidotes are recommended: 1. For phenic, sulphuric, muriatic, nitric, or nitro-muriatic acids, creosote, tincture of iodine, or phosphorus, use the white of an egg well beaten up in water, and a teaspoonful of mustard in warm water. In case sulphuric, nitric, or muriatic acid has been swallowed, it is necessary to take lime mixed with as small a quantity of water as possible.

Table of Poisons and Antidotes—Elsden's.

	Poisons.	Remarks.	Symptoms.	Antidotes.
Vegetable Acids.	Oxalic Acid, including Potassium Oxalate.	1 drm. is the smallest fatal dose known.	Hot burning sensation in throat and stomach, vomiting, cramps and numbness.	Chalk, whiting or magnesia suspended in water. Plaster or mortar can be used in emergency.
Caustic Alkalies.	Ammonia, Potash, Soda.	Vapor of ammonia may cause inflammation of the lungs	Swelling of the tongue, mouth and fauces, often followed by stricture of the œsophagus.	Vinegar and water.
Metallic Salts.	Mercuric Chloride.	Three grn. the smallest fatal dose known.	Acid metallic taste; constriction in throat and stomach, followed by nausea and vomiting.	White and yelk of raw eggs with milk. In emergency flour paste may be used.
	Acetate of Lead.	The subacetate is still more poisonous.	Constriction in the throat and stomach, crampy pains and stiffness of abdomen, blue line round the gums.	Sulphates of soda or magnesia. Emetic of sulphate of zinc.
	Cyanide of Potassium.	*a.* Taken internally, 3 grn. fatal.	Insensibility; slow, gasping respiration; dilated pupil and spasmodic closure of the jaws.	No certain remedy. Cold affusion on the head and neck most efficacious.
		b. Applied to wounds and abrasures of the skin.	Smarting sensation.	Sulphate of iron should be applied immediately.
	Bichromate of Potash.	*a.* Taken internally.	Irritant pain in stomach and vomiting.	Emetics and magnesia and chalk.
		b. Applied to slight abrasions of the skin.	Produces troublesome sores and ulcers.	
	Nitrate of Silver.		Powerful irritant.	Common salt to be given, immediately followed by emetics.
Concentrated Mineral Acids	Nitric Acid.	2 drm. have been fatal. Inhalation of fumes has also been fatal.	Corrosion of windpipe and violent inflammation.	Bicarbonate of soda or carbonate of magnesia, chalk, plaster of the room beaten up in water.
	Hydrochloric Acid.	4 drm. have caused death.		Same as nitric acid.
	Sulphuric Acid.	1 drm. has been fatal		Same as nitric acid.
	Acetic acid concentrated has as powerful effects as mineral acids.			
	Iodine.	Variable in its action; 3 grn. have proved fatal.	Acid taste; tightness about the throat; vomiting	Vomiting to be encouraged and gruel, arrowroot and starch given freely
	Ether.	When inhaled.	Effects similar to chloroform.	Cold affusion and artificial respiration.
	Pyrogallol.	2 grn. sufficient to kill a dog.	Resembles phosphorus poisoning.	No certain remedy; speedy emetic desirable.

—*American Amateur Photographer.*

2. For chromic acid, the chromates and colors that have chromium for a base, the compounds of copper, and such preparations as have antimony for a base (such as tartar emetic), and the compounds of mercury and zinc, use the whites of eggs in abundance, and, as an emetic, mustard, which, however, is useless if the poisoning has been done by tartar emetic.

3. For ammonia, soda, potassa, the silicates, and the alkaline hydrosulphates, use vinegar and afterward oil or milk.

4. For prussic acid and its salts, the cyanides of potassium and mercury, the sulphocyanides, oil of bitter almonds, or nitrobenzine, pour water on the patient's head or spinal column, and put mustard plasters on the sole of the feet and the stomach. Do not let the patient go to sleep.

5. For ether, petroleum, benzole, fruit essences, and concentrated alcohol, take strong mustard as an emetic, with much warm water, cold baths, and fresh air. Keep the patient awake.

6. For the compounds of baryta or lead, use mustard as an emetic, with warm water, Epsom salts or Glauber's salts in water.

7. For arsenic and its compounds, use mustard and dialyzed iron with magnesia, and, afterward, oil, milk, or mucilaginous liquids.

8. For oxalic acid and its salts, use lime or lime water, and afterward castor oil.

9. For nitrate of silver, use kitchen salt dissolved in water, and mustard as an emetic.

10. For the nitrous fumes from the manufacture of nitrate of iron, or of sulphuric acid, take acetic acid as strong as can be endured, in small quantities at a time.

Poisons and their Antidotes.—The following brief summary of the most rational and simple antidotes to the commoner forms of poison has been compiled for the *American Analyst* by Dr. Francis Wyatt, and it will be seen that he has suggested the most appropriate to be applied in any emergency pending the arrival or in the total absence of a skilled medical practitioner.

Domestic Treatment in Cases of Poisoning.—In case of poisoning a physician should be sent for immediately. The following is a list of substances recommended for domestic use in cases of emergency, by A. W. Blythe, M.R.C.S.

The Multiple Antidote.—1. Saturated solution sulphate of iron, 100 parts; water, 800 parts; magnesia, 88 parts; animal charcoal (kept in the dry state, mixed), 44 parts. Given in wineglass doses, in poisoning by arsenic, zinc, opium, digitalis (foxglove), mercury or strychnine. Useless in poisoning by phosphorus, antimony or caustic alkali.

2. Calcined magnesia, for use in poisoning by acids.

3. French turpentine, for phosphorus poisoning.

4. Powdered ipecacuanha, as an emetic, dose 30 grn., or zinc sulphute, dose 25 to 30 grn.

5. A tin of mustard (as emetic).

General directions: — First administer an emetic followed by the multiple antidote; this is not poisonous. For phosphorus give French turpentine, ½ drm. doses every half hour. For acids, give calcined magnesia. For alkalies, give vinegar. Preserve the vomit if intentional poisoning be suspected.

Poisons.	Antidotes.
1. Acid—Carbolic, sulphuric, nitric, muriatic, nitro-muriatic, creosote, iodine, phosphorus.	White of egg well beaten up with water. A teaspoonful of mustard flour in a cup of hot water. Very thick lime water—(in case of sulphuric, nitric, muriatic or nitro-muriatic acids).
2. Chromic acid, chromates, all preparations or compounds of chromium, antimony, copper, mercury, or zinc.	Abundance of white of egg in water. A teaspoonful of mustard flour in water. Copious draughts of an infusion of salt herbs.
3. Ammonia, soda, potash, alkaline, silicates, and sulphates.	Strong vinegar and water. Large doses of oil. Large doses of milk.
4. Prussic acid and its salts, all cyanides, and sulpho-cyanides, oil of bitter almonds, and nitro-benzine.	Continuous and heavy douches of ice cold water over the head and spinal column. Mustard plasters on the stomach and soles of the feet. Prevent sleep.
5. Ether, petroleum, benzine, fruit essence, concentrated or absolute alcohol.	Plenty of mustard flour in large quantity of hot water. Cold water douches. Fresh air. Prevent sleep absolutely.
6. Compounds of baryta and lead.	A teaspoonful of mustard flour in warm water. Strong solutions of Epsom salts and Glauber salts in cold water.
7. Compounds of arsenic.	A teaspoonful of mustard flour in warm water. A teaspoonful of dialyzed iron mixed with the same quantity of calcined magnesia every five minutes for one hour. Then plenty of oil, or milk, or some mucilaginous tea—say linseed.
8. Oxalic acid and its salts.	Very thick paste of lime and water by large spoonfuls at the time. After several of these, large draughts of lime water. Finally 4 oz. castor oil.
9. Nitrate of silver.	Large doses of ordinary kitchen salt dissolved in water, after which one teaspoonful of mustard flour in warm water.
10. Nitrous fumes of vapors, arising in vitriol or chemical works.	Frequent and small doses of strong acetic acid—the stronger, the better.

Poison Ivy. — Symptoms:—Contact with and with many persons the near approach to the vine gives rise to violent erysipelatous inflammation, especially of the face and hands, attended with itching, redness, burning and swelling, with watery blisters. Treatment: Give saline laxatives and apply weak lead water and laudanum, or lime water and sweet oil, or bathe the parts freely with spirits of niter. Anointing with oil will prevent poisoning from it.

Acetic Acid, Glacial.—Symptoms:—Corrosion, perforation, odor, abdominal pain, collapse. Treatment: Not stomach pump; soap and water, lime, magnesia, milk, oil, thick gruel. Morphia, against shock.

Aconite, monkshood, wolfsbane, blue rocket.—Symptoms:—Tingling and numbness, warmth at pit of stomach, paralysis from below up. Pulse and respiration depressed; mind clear. Treatment: Stomach pump or emetic; stimulants; atropia, hypodermic. Keep warm and recumbent. Digitalis hypodermic; amyl nitrite. Artificial respiration.

Alcohol, brandy.—Symptoms:—Intoxication, giddiness; lips livid; convulsions; coma; stupor. Treatment: Stomach pump or apomorphia hypoderm; battery, coffee, douche, amyl nitrite.

Almonds, oil of bitter. See Hydrocyanic acid.

Ammonia. — Symptoms: — Burning pain in mouth, stomach and chest. Membranes swollen, red; difficult breathing, bloody vomiting; pulse slow; pallor, loss of voice. Treatment: Not stomach pump. Vinegar, lemon juice; demulcent drinks; tracheotomy; inhalation of steam or chloroform; morphia, hypodermic, for shock.

Antimony, Tartar Emetic.—Symptoms:—Metallic taste, vomiting, choking sensation; pain in stomach, purging; thirst, cramps, cold sweat; head congestion, faintness; pulse and breathing weak; collapse. Treatment: Tannic or gallic acid; tea, coffee, demulcent drinks; stimulants; morphia, hypodermic.

Aquafortis. See *Nitric Acid.*

Arsenic, Vermin Killers, etc.—Symptoms:—Faintness, depression, burning pain; vomiting, purging; cramp, tightness in throat, thirst; pulse slow, breath painful, skin clammy; collapse. Treatment: Stomach pump, or apomorphia, hypodermic. Empty and wash the stomach well. Dialys. iron; magnesia, castor oil. Stimulants: Mucilaginous drinks. Warmth. Morphia, hypodermic.

Arum Maculatum, Cuckoo paint; lords and ladies, cows and calves; wake-robin.—Symptoms:—Vomiting, purging, convulsions; pupils dilated; coma; tongue swells. Treatment: Emetic, castor oil, coffee.

Atropine, Belladonna. See *Belladonna.*

Barium, Baryta.—Symptoms: — Vomiting, pain in bowels, purging; pulse and breathing distorted; cramps, paralysis, giddiness. Treatment: Stomach pump or emetic; sulphates; warmth. Stimulants: Morphia, hypodermic.

Belladonna, Deadly Nightshade. — Symptoms:—Mouth, throat hot; eyes sparkling, face flushed, pupils dilated; delirium, staggering; rash (?). Treatment: Stomach pump or emetic. Stimulants Coffee; pilocarp; hypodermic; artificial respiration.

Benzol, Benzine. — Symptoms: — Narcotic; twitching, difficult breathing, head noises. Treatment: Stomach pump or emetic. Stimulants: Atropia, hypodermic; douche; battery; artificial respiration.

Brucine. See *Strychnine.*

Calabar Bean. See *Physostigmine.*

Camphor. — Symptoms: — Odor; faintness, languor, delirium, convulsions, coldness; pulse quick, breathing difficult. Treatment: Stomach pump or apomorphia hypodermic. Stimulants: Warmth; douche.

Cantharides, Spanish Fly. — Symptoms:—Burning pain, throat and stomach; diarrhea salivation, albuminous urine; high temperature, headache, quick pulse; insensibility, convulsions. Treatment: Stomach pump (?) or emetic; demulcent drinks, no oil; morphia; baths; linseed poultice.

Carbolic Acid.—Symptoms:—Burning pain in mouth and stomach; mucous membrane, white, hardened; skin, cold; pupils, contracted; urine, dark; insensibility; coma; collapse. Treatment: Stomach pump or emetic; soda or sacch. lime; white of egg; castor oil; stimulants: warmth; battery; atropia, hypodermic; nitrite amyl; bleeding.

Carbonic Acid, Choke Damp, Same for Carbonic Oxide.—Symptoms:—Pains, head and throat; giddiness; sleepiness; insensibility; heart and breath hurried; coma. Treatment: Fresh air; artificial respiration; ammonia *resp.*; friction; stimulants; oxygen douche; transfusion or bleeding (?).

Caustic Potash or Soda. See *Potash.*

Chloral.—Symptoms:—Sleep; loss of muscular power; reflex action; sensibility diminished; stertorous breathing. Treatment: Stomach pump or emetic; warmth; rousing; coffee; strychnine, hypodermic; nitrite amyl; artificial respiration.

Chlorine.—Symptoms:—Tightness; irritation, chest; cough; difficult breathing, swallowing. Treatment: Fresh air; inhale steam; dilute ammonia; sulphur; hydrogen; chloroform; ether.

Chloroform.—If swallowed: Stomach pump or emetic; carbonate soda solution; rousing; mustard to the heart; nitrite amyl. If Inhaled: Fresh air; douche; artificial respiration; nitrite amyl; battery.

Choke Damp. See *Carbonic Acid.*

Chromium, Chromates. — Symptoms:—Vomiting; purging; cramps; depression; suppression urine; pupils dilated. Treatment: Stomach pump or emetic; magnesia carbonate; chalk; gruel.

Coal Gas.—Symptoms:—Giddiness; insensibility; difficult breathing; asphyxia; coma. Treatment: Mustard to the heart. Also as for carbonic acid.

Cocculus Indicus. See *Picrotoxine.*

Colchicum, Meadow Saffron.—Symptoms:—Vomiting; purging; throat irritation; thirst; sweat; twitchings; delirium. Treatment: Stomach pump or emetic; tannic; gallic acid; demulcent drink; stimulants; morphia.

Colocynth.—Symptoms:—*Vomiting*; purging; cold; weak pulse; collapse. Treatment: Stomach pump or emetic; camphor, and similar to colchicum.

Conine, Hemlock. — Symptoms:— Staggering; loss of muscular power; sight; difficult breathing, swallowing; asphyxia. Treatment: Stomach pump or emetic; tannic, gallic acid; warmth; artificial respiration; stimulants; atropia, hypodermic.

Copper.—Symptoms:—Colic, griping; metallic taste; vomiting, purging; thirst, sweating, coldness, giddiness, coma. Treatment: Stomach pump or emetic; demulcent drink; morphia, hypodermic; linseed poultice.

Croton Oil.—Symptoms:—Abdominal pain, purging, vomiting; cold skin, collapse. Treatment: Stomach pump or emetic; camphor, stimulants, morphia; gruel; linseed poultice.

Curarine.—Symptoms: —Paralysis of motors and respiration. Treatment: Artificial respiration; stimulants; ligature and wash wound.

Cyanides. See *Hydrocyanic Acid.*

Daturine. See *Atropine.*

Digitalis (Foxglove).—Symptoms:—Abdominal pain, purging, vomiting; headache, small pulse, delirium, convulsions; cold skin, sweat; pupils dilated. Treatment: Stomach pump or emetic; stimulants; tannic acid; keep patient lying.

Ergot.—Symptoms:—Tingling, cramps, vomiting, diarrhea. Treatment: Stomach pump or emetic; tannic, gallic acid; nitrate amyl; stimulants; keep warm, lying down.

Ether. — Symptoms: — Anæsthetic action. Treatment: Artificial respiration; fresh air;

douche, stimulants; blows on chest if heart stops.

Fly Powders.—Generally treatment for arsenic.

Gas. See *Coal Gas.*

Gelsemium.—Symptoms:—Giddiness; pain eyes and brows, double sight, weakness, suffocation, coma. Treatment: Stomach pump or emetic; douche; stimulants; artificial respiration.

Hydrochloric Acid, Muriatic acid; spirits; salts.—Symptoms:—Burning pains, vomiting, thirst. Treatment: Not stomach pump (?); bicarbonate soda; magnesia, lime water, soap water, demulcent drinks; morphia, hypodermic.

Hydrocyanic Acid, Prussic acid.—Symptoms:—Insensibility; pupil dilated, skin cold, sweating, difficult breathing. Treatment: Stomach pump or emetic; ammonia inhaled; stimulants; atropia, hypodermic; artificial respiration; battery.

Hyoscyamine. See *Belladonna.*

Iodine.—Symptoms:—Stomach, throat pain, vomiting, purging, giddiness, faintness (starch test). Treatment: Stomach pump or emetic; starch; nitrite amyl; morphia.

Jaborandi.—Same treatment as pilocarpine; stomach pump or emetic.

Laburnum.—Symptoms:—Purging, vomiting, drowsiness, convulsions. Treatment: Douche; stimulants; coffee.

Lead.—Symptoms:—Metallic taste, thirst, colic, cramps, cold sweat, paralysis. Treatment: Stomach pump or emetic; sulphates; iodide potassium; morphia.

Lemons, Salt of. See *Oxalic Acid.*

Lobelia.—Symptoms:—Vomiting, giddiness, tremors, convulsions, depression, collapse. Treatment: Stomach pump or emetic, tannic acid; warmth; stimulants; keep lying down.

Morphia.—Symptoms:—Intoxication; sleep; pupils contract; respiration and pulse slow, depressed. Treatment: Stomach pump or emetic; rouse; inhale ammonia; douche; battery; atropia, hypodermic; nitrite amyl; artificial respiration.

Muscarine, Fly fungus, mushrooms.—Symptoms:—Colic, purging, vomiting, excitement, coma. Treatment: Stomach pump or emetic; stimulants, castor oil, warmth; atropia, hypodermic.

Nicotine. See *Tobacco.*

Nitrate of Potassium, Saltpeter.—Symptoms:—Nausea, purging, vomiting, coldness, tremors, convulsions, paralysis. collapse. Treatment: Stomach pump or emetic; demulcent drinks, stimulants, warmth, nitrite amyl; atropia, hypodermic.

Nitric Acid.—Symptoms:—Corrosion, vomiting, abdominal pain; difficult breathing. Treatment: Not stomach pump; magnesia, lime water, gruel, oil; morphia, hypodermic; tracheotomy.

Nitro-benzol, Artificial Essence Almonds—Symptoms:—Nausea, difficult breathing, drowsiness, stupidity; coma. Treatment: Stomach pump or emetic; stimulants; douche; artificial respiration; battery; atropia, hypodermic.

Nitrous Oxide.—Symptoms:—Anasthæsia. Treatment: Fresh air, oxygen; artificial respiration.

Opium. See *Morphine.*

Oxalic Acid.—Symptoms:—Vomiting, purging, cramps. Treatment: Chalk, sacch. lime; purgatives; no potash, soda or ammonia.

Phosphorus (matches).—Symptoms:—Odor; vomiting; purple spots; delirium. Treatment: Emetic; French oil of turpentine; copper sulphate; purgative.

Physostigmine, Calabar bean.—Symptoms:—Faintness, prostration, twitching, giddiness; no delirium. Treatment: Stomach pump or emetic, stimulants; artificial respiration; atropia, hypodermic; chloral; strychnia, hypodermic.

Picrotoxine.—Symptoms:—Vomiting, weakness, sleep, eruption. Treatment: Stomach pump, chloral, potassium bromide.

Pilocarpine.—Symptoms:—Sweating, salivation, headache, quick pulse. Treatment: Atropia hypodermic, or belladonna by mouth.

Potash.—Symptoms:—Caustic taste, corrosion, painful purging, skin cold. Treatment: Not stomach pump; vinegar, lemon juice, oil, demulcent drink.

Prussic Acid. See *Hydrocyanic Acid.*—Stomach pump or emetic.

Resorcin.—Symptoms:—Prickling of the skin, giddiness, sweating, insensibility, white lips, dry tongue. Treatment: Albumen, soda, sacch. lime; stimulants; warmth, battery, nitrate amyl; atropia, hypodermic.

Savin.—Symptoms:—Vomiting, painful purging, coma, convulsions. Treatment: Emetic, linseed poultice, purgative, morphia, hypodermic.

Sewer Gas.—Symptoms: Livid lips, conjunctivæ injected, pupils dilated, insensible, tonic convulsions, high temperature. Treatment: Fresh air, artificial respiration, ammonia. Stimulants: Coffee. Hot and cold douche.

Snake Bite.—Treatment:—Cauterization and ligature. Stimulants; Permanganate, liquor potassæ; artificial respiration; ammonia injection.

Soda. See *Potash.*

Soothing Sirup. See *Opium.*

Stramonium, Thorn apple.—Symptoms:—Pupils dilated, delirium, rash on skin, paralysis, coma. Treatment: Stomach pump or emetic; coffee, stimulants; pilocarp, hypodermic; artificial respiration; mustard douche to limbs.

Strychnine.—Symptoms:—Convulsions. Treatment: Stomach pump or emetic; potassium bromide; animi; charchi; nitrite amyl; curare; artificial respiration.

Tartaric Acid. See *Acids.*—Symptoms:—Convulsions. Treatment: Alkalies (potash and soda) and ammonia, not suitable. Use lime, castor oil.

Tobacco.—Symptoms:—Vomiting, dim vision, weak pulse, and cold skin. Treatment: Stomach pump or emetic; stimulant, strychnia, hypodermic; tannic acid; hot application to skin; keep patient lying down.

Turpentine.—Symptoms:—Intoxication, coma, collapse, pupils contracted. Treatment: Stomach pump or emetic; apomorphia if necessary; magnesia, sulphur; demulcent drink.

Veratrine.—Symptoms:—Thirst, vomiting, painful diarrhea, headache, weak pulse. Treatment: Stomach pump or emetic; coffee, stimulants; warm application; keep patient lying down.

Zinc.—Symptoms:—Painful vomiting, quick pulse and breathing, paralysis, coma. Treatment: Potassium or sodium carbonate; tannic or gallic acid; milk; eggs; morphia, hypodermic.

Pole, Warped.—Wet the concave side, and then hold the convex side to the fire.

Poho.—Poho, a Chinese essence for headache, etc., consists, according to Hagar, of good and pure peppermint oil, rather good and resinous. According to others it is a mixture of Epsom salts and peppermint oil, or of the latter with oil of almonds.

Polishing.—*Agate, to Polish.*—Quartz and agate are slit with a thin iron disk supplied with diamond dust moistened with brick oil. The rough grinding is done on a lead wheel supplied with coarse emery and water. The smoothing is done with a lead lap and fine emery, and the polishing may be accomplished by means of a lead lap, whose surface is hacked and supplied with rottenstone and water.

Alabaster, to Polish.—First use pumice stone, then apply a paste made of whiting, soap and water, and lastly rub with Canton flannel.

Polishes for Boots and Shoes, and *Stoves, Blacking for.* See **Blacking.**

Book Edges, to Polish.—This is done with a

wolf's or dog's tooth, or a steel burnisher; for this purpose place the books in a screw press, with boards on each side of them, and other boards distributed between each volume; first rub the edges well with the tooth to give them a luster. After sprinkling or staining and when the edges are dry, burnish the front; then turning the press, burnish the edges at the top and bottom of the volume. Burnish the gilt edges in the same manner, after having applied the gold; but observe, in gilding, to lay the gold first upon the front, and allow it to dry; and on no account to commence burnishing till it is quite dry.

Brass, to Polish.—Brass, Polishing Paste for.—1. Three parts of oxalic acid are dissolved in 40 parts of hot water, and add 100 parts of powdered pumice stone, 2 parts of oil of turpentine, 12 parts of soft soap and 12 parts of a fat oil.

2. For Brass and Copper.—Rottenstone, 3 oz.; powdered soap, 1 oz.

3. Rottenstone, 7 oz.; powdered oxalic acid, 1 oz. Both are used with a little water.

4. Soft soap, 2 oz.; rottenstone, 4 oz.; beaten to a paste.

5. Rottenstone made into a paste with sweet oil.

6. Rottenstone, 4 oz.; oxalic acid, in fine powder, 1 oz.; sweet oil, 1½ oz.; turpentine, q. s., to make a paste.

The above are used to clean brass work, when neither varnished nor lacquered. The first and last are best applied with a little water, the second with a little spirit of turpentine or sweet oil. Both require friction with soft leather.

Brass, Copper, German Silver, etc., to Polish.—Use Vienna lime with oil.

Brass, to Polish. — Rub the metal with rottenstone and sweet oil, then rub off with a piece of cotton flannel, and polish with soft leather. A solution of oxalic acid rubbed over tarnished brass soon removes the tarnish, rendering the metal bright. The acid must be washed off with water, and the brass rubbed with whiting and soft leather. A mixture of muriatic acid and alum dissolved in water imparts a golden color to brass articles that are steeped in it for a few seconds.

Brass Polishes.—1. Make a paste of equal parts of sulphur and chalk, with sufficient vinegar to reduce it to the proper consistency; apply it to the metal while moist, allow it to dry on, and rub with a chamois skin. For ornaments or engraved work, clean with a brush.

2. Another process, and one that gives to the brass a very brilliant color, is to make a wash of alum boiled in strong lye, in the proportion of 1 oz. alum to 1 pt. lye. Wash the brass with this mixture, and afterward rub with chamois and tripoli.

3. A weak solution of ammonia in water makes an excellent wash. Apply it with a rag, dry with a piece of shammy, and afterward rub with a piece of shammy and a very small quantity of jewelers' rouge.

4. Place 2 oz. sulphuric acid in an earthen vessel and add 1 qt. cold soft water; after the heat that is generated has passed off, add 1 oz. each tripoli and jewelers' rouge. When well mixed, put in a bottle for use.

5. Brass may be polished without a burnisher, by using an exceedingly fine cut file, and fine emery cloth.

6. Small articles to be polished should be shaken by themselves for a short time; then some greasy parings of leather should be put in the barrel with them. After they have been shaken smooth, the greasy leather parings are replaced by clean ones and the shaking is continued as long as necessary.

7. When the brass is made smooth by turning, or filing with a very fine file, it may be rubbed with a smooth fine grained stone, or with charcoal and water. When it is made quite smooth and free from scratches, it may be polished with rottenstone and oil, alcohol, or spirits of turpentine.

8. Brass work can be polished by rubbing the metal with finely powdered tripoli mixed with sweet oil and applied with a rubber made from a piece of an old hat or felt. Or else a mixture of glycerine, stearine, naphthaline, or creosote mixed with dilute sulphuric acid can be used.

9. Magic Polish for Brass.—Sulphuric acid, 20 parts; pulverized bichromate of potash, 10 parts; dilute with an equal weight of water; apply well to the brass. Wash well in water, immediately wipe dry, and polish with rottenstone.

Celluloid, to Polish.—Make a kind of putty of hot soap, free from rosin, in which equal parts of fine pumice stone and flour emery have been mixed.

Polishing Cloth.—1. In 20 oz. water dissolve 4 oz. soap, and gradually add 2 oz. pumice stone or finely powdered emery.

2. Infusorial earth may be used with advantage. Saturate the best unbleached muslin with this paste. Color with a little aniline red, if desired.

Polishing Compound.—Emerson's compound for polishing and cleaning glass, silver plate, tinware, and surfaces that permit only slight friction and but little action, consists of water, 4 oz.; carbonate of ammonia, 1 oz. When dissolved add 16 oz. Paris white, with aniline for coloring. This forms a solid. As the Paris white consists of white lead, all who purchase this compound should beware of using it upon the inside of culinary vessels.

Putty Powder.—Put tin, as pure as possible, into a glass vessel—a wineglass does very well when making small quantities—and pour in sufficient nitric acid to cover it. Great heat is evolved, and care must be taken not to inhale the fumes, as they are poisonous. When there is nothing left but a white powder, it is heated in a Hessian crucible, to drive off the nitric acid. For *Crocus* see **Crocus.**

Cutlery.—The burnishing of cutlery is executed by hand or vise burnishers; they are all made of fine steel, hardened, and well polished. The first kind have nothing particular in their construction; but vise burnishers are formed and mounted in a very different manner. On a long piece of wood, placed horizontally in the vise, is fixed another piece, as long, but bent in the form of a bow, the concavity of which is turned downward. These two pieces are united at one of their extremities by a pin and a hook, which allows the upper piece to move freely around this point as a center. The burnisher is fixed in the middle of this bent piece, and it is made more or less projecting, by the greater or lesser length which is given to its base. The movable piece of wood, at the extremity opposite to the hook, is furnished with a handle, which serves the workman as a lever. This position allows the burnisher to rest with greater force against the article to be burnished, which is placed on the fixed piece of wood. The burnisher has either the form of the face of a round headed hammer, well polished to burnish those pieces which are plain or convex; or the form of two cones opposed at their summits, with their bases rounded, to burnish those pieces which are concave or ring shaped.

Emery Paper.—Emery paper is extensively employed for cleaning and polishing metals, but all the kinds in use hitherto have the great disadvantage of not retaining an equal efficiency. The fresh parts bite too much, and the paper itself soon gets worn through in places. Emery on linen has been tried, with good success. The emery paper recommended by the *Manufacturer and Builder* is not a pasteboard with emery on both sides, but a board in which emery enters as a constituent part. Fine and uniform cardboard pulp must be procured, and ⅛ to ½ its weight of emery powder thoroughly

mixed with it, so that the emery may be equally distributed. The mass is then poured out in cakes of 1 in. to 10 in. in thickness. They must not be pressed hard, however, but allowed to retain a medium pliability. This paper will adapt itself to the forms of the articles, and will serve until completely worn out.

Emery Wheels.—1. Can be made with shellac powdered fine, and a small portion of rosin, a piece about the size of a walnut, to 1 oz. shellac, and a piece of old vulcanized India rubber about the same size, which gives it toughness. Shellac about 1 oz. to 1 lb. of emery, well melt, and stir about in a small frying pan; well mix the powders before applying heat. Be careful not to burn it, or get grease in it; have a ring of iron and a piece of plate iron prepared with black lead and beer pretty thick; place the ring upon the plate and make a mould, turn the stuff into it, and well ram down evenly; put on one side to cool; when cold, turn out and chuck in lathe, and with a piece of red hot iron bore a hole for spindle; after spindled put between centers, and trice up with hot iron. Very good grindstones may be made with silver sand mixed with powdered glass, and it is necessary to have some body besides shellac for coarse emery to form a body to bed the grains in. Emery dust from grinding glass, and Turkey stone slips, and slate, may be used as a substitute for the flour.

2. Good emery wheels are formed of clean emery compounded with just enough boiled linseed oil, the mixture being agitated for a sufficient period under exposure to a considerable heat and free access of atmospheric air, or some still more powerful oxidizing agent; it assumes the necessary degree of *tenacity*, and while warm, being exposed to hydraulic pressure in a suitable mould, and subsequent drying in a stove, the emery wheel is complete.

Friction Polish.—A good polish for iron or steel rotating in the lathe is made by using fine emery and oil; which is applied by lead or wood clamps, screwed together. Three very good oils for lubrication are olive oil, sperm, and neats'foot.

Furniture, to Polish. See *Wood Polishing*, below.

Gas Fixtures, to Polish.—Pickle, and while in the lathe dip the burnisher in the following liquid: Turmeric root, 60 parts; orange shellac, 60 parts; dissolved in alcohol tartar, 120 parts; ox-gall, 3 parts; alcohol, 6 parts; water, 180 parts; dry with a soft cloth.

German Silver, to Polish.—Take 1 lb. peroxide of iron, pure, and put half of it into a wash basin, pouring on water, and keeping it stirred until the basin is nearly full. While the water and crocus are in slow motion, pour off, leaving grit at the bottom. Repeat this a second time, pouring off into another basin. Cleanse out grit, and do the same with the other half. When the second lot is poured off, the crocus in the first will have settled to the bottom; pour off the water gently, take out the powder, dry it, and put both when washed clear of grit, and dried, into a box into which dust cannot get. If the silver work is very dirty, rub the mixture of powder and oil on with the fingers, and then it will be known if any grit is on the work. If the work is not very black, take a piece of soft chamois leather, and rub some dry crocus on, and when well rubbed, shake out the leather, and let the powder fall off that is not used, or rub it off with a brush. Do not put down the leather in the dust.

Gold, to Polish.—1. Use rouge on a buff moistened with alcohol.

2. Use jeweler's rouge with a brush.

Gold Polishing Powder for.—1. Eighteen parts of chalk are mixed with 5 parts of talc, 2 parts of silica, 5 parts of alumina, 2 parts of carbonate of magnesia, and 2 parts of jeweler's red.

2. Rock alum (burned and finely powdered), 5 parts; levigated chalk, 1 part; mix, and apply with a dry brush.

Gold and Silver Lace.—Gold lace, spangles, clasps, knots, etc., may be brushed over with the following composition: One and one-half oz. shellac, ½ drm. dragon's blood, ½ drm. turmeric root; digest with strong alcohol, decanting the ruby red colored tincture thus obtained. After coating with this composition, a warm flat iron is gently brushed over the objects, so as to heat them only very slightly. Gold embroidery can be similarly treated. Silver lace or embroidery may be dusted over with the following powder and well brushed: Take alabaster, and strongly *ignite* it, and while still hot place it in corn brandy; a white powder is thus obtained, which is fit for use after heating over the flame of a spirit lamp. It should be dusted on from a linen bag.

Gold Workers, Polishing Powder for.—Carbonate of lead, 21½ parts; carbonate of lime (chalk), 87 parts; carbonate of magnesia, 8½ parts; alumina, 21½ parts; silica, 13 parts; jeweler's rouge, 8½ parts. Mix together.

Grindstone, Artificial.—Washed silicious sand, 3 parts; shellac, 1 part; melt the lac, and mould in the sand, while warm. Emery may be substituted for sand. Used for razors and fine cutlery.

Horn and Bone, to Polish.—1. Use finely ground pumice stone and water, applied with felt polishing wheel; finish with rottenstone applied in the same way.

2. Having scraped the work perfectly smooth and level, rub it with very fine sand paper, repeat the rubbing with a bit of felt dipped in finely powdered charcoal with water; and lastly, with rottenstone or *putty powder* and finish with a piece of soft wash leather, damped with a little sweet oil; or still better, rub it with subnitrate of bismuth by the palm of the hand.

3. First scrape with glass to take off any roughness, then grind some pumice stone to powder, and with a piece of cloth wetted and dipped in the powder, rub them until a smooth face is obtained. Next polish with rottenstone and linseed oil, and finish with dry flour and a piece of clean linen rag. The more rubbing with the stone and oil, the better the polish. Trent sand is used in the Sheffield factories. It is a very fine and sharp sand, and is prepared for use by calcining and sifting.

Iron, to Polish.—You cannot keep the bright color of polished iron on the hot parts of an engine without constant attention and wiping with engine oil. Oxalic acid may help the cleaning, but the acid left on the bright surface favors oxidation. For cleaning, use tripoli, rottenstone, or pulverized pumice stone, with engine or kerosene oil. Neglected or dirty spots may be removed with a scraper and fine emery paper, and afterward rubbed with oil. Every part of bright work around an engine should be wiped with oil. Moisture immediately discolors a clean bright surface. Polish the lubricator with rottenstone and oil only, and only when necessary. Too much polishing soon makes it look old from wear.

Iron and Steel, to Polish.—1. Usually the article to be polished is first rubbed down with emery of gradually increasing fineness, after which the article is moistened with alcohol or water and polished with Vienna lime, rouge or tin putty.

2. Use tin putty and hartshorn triturated in alcohol. Use with any soft leather; this is an excellent polish.

3. Take an ordinary bar of malleable iron in its usual merchantable state, remove the oxide from its surface by the application of diluted sulphuric acid, after which wash the bar in an alkaline solution, then cover the entire bar with oil or petroleum. The bar is then ready for the chief process. A muffle surface is so prepared that a uniform, or nearly uniform, heat can be maintained within it, and in this furnace the bar is placed. Care must be taken that too great a heat is not imparted to it, for on this depends the success of the operation.

When the bar approaches a red heat, and when the redness is just preceptible, it is a certain indication that the proper degree has been attained. The bar is then at once removed and passed through the finishing rolls five or six times, when it will be found to have a dark polished uniform surface and the appearance of Russian sheet iron.

4. Keys, Key Rings and Other Articles of Iron.—Finish them well with a dead smooth file, then mix some fine emery and oil together, hold the key in wood clamps, take some long strips of wash leather, dip in the above and polish well every part until all scars dissappear, then tie two or three dozen on a piece of iron binding wire, put them in an iron box with leather scraps burnt and made into a fine powder, cover bottom of box ½ in. thick, spread out the keys on this, cover them up with the powder or leather dust, put a lid on, tie down, put in a slow fire until the box is red hot, soak about twenty minutes, then open the box, take out the keys quick, plunge them in oil—water makes them too brittle; now repeat the polishing as before, with long leather strings dipped in the oil and emery, until all the black from the hardening is off every part, then take them to the brushing frame, charge your brush well with flour of emery, keep turning the key in every direction until the polish begins to appear; after this dip them in slaked lime, and get off every particle of grease. Take them to another brushing frame, the brush charged with crocus and water; keep dipping the key in occasionally, and follow up process on the brush until the polish comes up well. To put the extra gloss or polish on, take the leather strings as before, this time dipped in a mixture of putty powder and water; work the string well over every part until dark polish comes up. If you wish a higher polish, it is done by hand—that is, girls dip their hands in the putty powder mixture above and rub every possible part up with the palm of the hand, and this gives the beautiful polish that is upon them.—*Aubin.*

5. Boden recommends the following method of brightening the surfaces of iron plates, wire, etc., as the result of numerous experiments made in the laboratory of the Industrial Museum at Munich: The object, whatever it may be, just as it comes from the forge, is laid for the space of one hour in dilute sulphuric acid (⅛ part acid). The action of the acid may be increased by the addition of a little carbolic acid (?). The forge scales are loosened by the action of the acid, and the object is then washed clean with water and dried with sawdust. Next, it is held for an instant in nitrous acid, the operator of course being on his guard against the nitrous fumes, washed again carefully, dried in sawdust and rubbed over clean. Iron goods thus treated acquire a perfectly bright, pure surface, having a white glance, without the intervention of any mechanical process of polishing.

6. Steel.—Use bell metal polishers for arbors, having first brought up the surface with oilstone dust and oil and soft steel polishers; for flat pieces use a piece of glass for the oilstone dust, a bell metal block for the sharp red stuff, and a white metal block for the fine red stuff. The polishing stuff must be well mixed up and kept very clean; the polishers and blocks must be filed to clean off the old stuff, and then rubbed over with soft bread; put only a little red stuff on the block and keep working it until it is quite dry; the piece will then leave the block quite clean; use bread to clean off the surplus red stuff before using the brush. If the piece is scratched, put on some more red stuff, which must not be too wet, and try again.

7. The polish on flat steel pieces in fine watchwork is produced with oilstone dust, burnt Turkey stone, and a steel polisher, soft steel, bell metal, and sharp stuff, grain tin and glossing stuff. The metals are squared with a file and vary in shape according to the work in hand.

8. Get an 18 gal. barrel and put an iron spindle through the two ends; mount it on trestles in the same way as a butter churn, with a winch to turn it by; cut out a hole in the side by which to introduce the articles to be polished; have a tight fitting cover to the hole; procure some worn out casting pots or crucibles, such as used by founders, and pound them in an iron mortar until fine enough to pass through a sieve which will not allow the steel articles to pass through. Put equal quantities of this grit and of the articles in the barrel; fasten on the cover and turn the barrel for about an hour at the rate of about fifty turns a minute; take all out of the barrel and sift out the grit. If a finer polish than this is required, put them through another turning, substituting for the grit small scraps of leather called mosings, which can be procured from curriers, and emery flour. Do not more than half fill the barrel.

9. Iron (Wrought), to Polish. Warm goods till they are unbearable to the hand; then rub with new clean white wax. Heat the goods again so that the wax may spread on them; then rub them over with a piece of serge.

10. To Give Iron Articles a Brilliant Luster.—Pulverized arsenious acid, 7½ drm.; elutriated bloodstone, 7½ oz.; antimony trichloride (butter of antimony), 3¾ oz. Pour over these materials 5 pt. alcohol 90%. Digest at a gentle heat, shaking frequently. When iron is polished with this fluid, it precipitates upon it a thin film of antimony and arsenic, which protects the iron from oxidation, and also gives it a fine appearance,

11. To Make Iron Take a Bright Polish Like Steel.—Blue vitriol, 1½ oz.; borax, 1½ oz.; prussiate of potash, 1½ oz.; charcoal, 1½ oz.; salt, ¾ pt. Pulverize, and dissolve in 1½ qt. hot water. Add 1½ gal. linseed oil; mix well. Bring the iron or steel to the proper heat, and cool in this solution.

Ivory, to Polish.—Pumice stone and putty powder.

Lead, to Polish.—Use Jewelers' rouge on a chamois skin.

Zinc, to Polish.—Scrape, and polish with Vienna lime.

Polishing the Edges of Leather Straps.—First you will want an edge tool. If only a light single strap, a No. 1 will do, which is run down the edge to take it off and make it round. Next rub it down with fine sandpaper; then, if for brown leather, get some good harness blacking, put as much as you want to use into a cup, dissolve some oxalic acid in water, and pour in as much as will turn it a light brown, apply it to the edge of the strap, and rub it down with a clean cloth till the edge is smooth and glossy. Next you will want a screw crease (which you can procure at the tool shops), which is heated in the fire or gas till it is just hot enough to mark the leather without burning it; you can set it with the thumb screw to any width you like, up to ½ in. or ⅝ in. Lay the strap on a flat piece of planed board; then, holding the crease firmly in the hand, you run it down the strap; alter the width for every mark or line.

Marble.—1. If the piece to be polished is a plane surface, it is first rubbed by means of another piece of marble, or hard stone, with the intervention of water and two sorts of sand; first with the finest river or drift sand, and then with common house or white sand, which latter leaves the surface sufficiently smooth for the process of gritting. Three sorts of grit stone are employed: first, Newcastle grit; second, a fine grit brought from the neighborhood of Leeds; and lastly, a still finer, called snake grit, procured at Ayr, in Scotland. These are rubbed successively on the surface with water alone; by these means, the surface is gradually reduced to closeness of texture, fit-

ting it for the process of glazing, which is performed by means of a wooden block having a thick piece of woolen stuff wound tightly round it; the interstices of the fibers of this are filled with prepared putty powder (peroxide of tin), and moistened with water; this being laid on the marble and loaded, it is drawn up and down the marble by means of a handle, being occasionally wetted, until the desired gloss is produced. The polishing of mouldings is done with the same materials, but with rubbers varied in shape according to that of the moulding. The block is not used in this case; in its stead a piece of linen cloth is folded to make a handful; this also contains the putty powder and water. Sand rubbers employed to polish a slab of large dimensions should never exceed ⅔ of its length nor ⅓ of its width; but if the piece of marble is small, it may be sanded itself on a larger piece of stone. The grit rubbers are never larger than that they may be easily held in one hand; the largest block is about 14 in. in length and 4½ in. in breadth.

2. Polishing includes 5 operations. Smoothing the roughness left by the burin is done by rubbing the marble with a piece of moist sandstone; for mouldings, either wooden or iron mullers are used, crushed and wet sandstone, or sand, more or less fine according to the degree of polish required, being thrown under them. The second process is continued rubbing with pieces of pottery without enamel, which have only been baked once, also wet. If a brilliant polish is desired, Gothland stone instead of pottery is used, and potter's clay or fuller's earth is placed beneath the muller. This operation is performed upon granites and porphyry with emery and a leaden muller, the upper part of which is incrusted with the mixture until reduced by friction to clay or an impalpable powder. As the polish depends almost entirely on these two operations, care must be taken that they are performed with a regular and steady movement. When the marble has received the first polish, the flaws, cavities, and soft spots are sought out and filled with mastic of a suitable color. This mastic is usually composed of a mixture of yellow wax, rosin, and Burgundy pitch, mixed with a little sulphur and plaster passed through a fine sieve, which gives it the consistency of a thick paste; to color this paste to a tone analogous to the ground tints or natural cement of the material upon which it is placed, lampblack and rouge, with a little of the prevailing color of the material, are added. For green or red marbles, this mastic is sometimes made of lac, mixed with Spanish sealing wax of the color of the marble; it is applied hot with pincers, and these parts are polished with the rest. Sometimes crushed fragments of the marble worked are introduced into this cement; but for fine marbles, the same colors are employed which are used in painting, and which will produce the same tone as the ground; the lac is added to give it body and brilliancy. The third operation of polishing consists in rubbing it again with hard pumice, under which water is constantly poured, unmixed with sand. For the fourth process, called softening the ground, lead filings are mixed with the emery mud produced by the polishing of mirrors or the working of precious stones, and the marble is rubbed with a compact linen cushion, well saturated with this mixture; rouge is also used for this polish.

For some outside works, and for hearths and paving tiles, marble workers confine themselves to this polish. When the marbles have holes or grains, a leaden muller is substituted for the linen cushion. In order to give a perfect brilliancy to the polish, the gloss is applied. Well wash the prepared surfaces, and leave them until perfectly dry; then take a linen cushion, moistened only with water and a little powder of calcined tin of the first quality. After rubbing with this for some time, take another cushion of dry rags, rub with it lightly, brush away any foreign substance which might scratch the marble, and a perfect polish will be obtained. A little alum mixed with the water used penetrates the pores of the marble, and gives it a speedier polish. This polish spots very easily, and is soon tarnished and destroyed by dampness. It is necessary, when purchasing articles of polished marbles, to subject them to the test of water; if there is too much alum, the marble absorbs the water, and a whitish spot is left.

3. To polish imitation marbles, when you have finished marbling, let the work stand for a day or two; then gently rub it down with the back or smooth side of a sheet of sandpaper; this will take off the knits or bits of skin which may be upon it, without scratching it; now give it three coats of the best pale polishing copal varnish, allowing an interval of two days after each coat. Let this stand for three weeks; then cut it down with ground pumice and water, using a piece of wash leather or rag for that purpose. When you have got it tolerably smooth and level, wash it well with plenty of clean water, taking particular care to clean off all the pumice; give it five coats of varnish. It ought now to stand for three to six months before it is polished, for if it is done before it is almost certain to crack. When the varnish is sufficiently hard, cut it down with finely ground pumice as before; then use rottenstone and olive oil, with the ball of the hand; then flour and oil; finish off with dry flour. This takes a deal of time to do it properly.

4. Mr. W. C. Durkee (Boston) gives the following formula for a marble dressing or polish:

Pure beeswax 10	parts.
Japan gold size..... 2	parts.
Spirits of turpentine.....88	parts.

The mixture is of creamy consistence, and should be applied in small quantities, with the aid of a piece of white flannel. If it is desired for use upon white marble, white wax may be substituted. The same preparation can be used to advantage on woodwork. The Japan size prevents the stickiness which exists when wax alone is used.

5. For polishing a Black Marble Clock try the following:

Linseed oil..... 4	oz.
Elemi..... ½	oz.
Methylated spirit 2	oz.
Turpentine..... 5	oz.
Acetic acid ..... ½	oz.
Water..... 3½	oz.

Dissolve the elemi in the methylated spirit and strain. Mix with the oils, and add the aqueous fluids.

Metals, Polishing and Finishing of.—We now come to the means adopted for finishing and polishing steel and iron. Take, for instance, a surface of steel as an example. The square stem of a drilling instrument will form a very good subject. After it is roughed out and the work all done, it must be draw filed, and this must be done with a superfine Lancashire file, and the lines must be kept quite straight, otherwise it will require so much emery paper that the edges will lose the sharp angles which are the beauty of the work. Any ordinary workman can rub away with emery paper, but in so doing he may spoil the appearance of a piece of good work, and that without knowing it. To avoid this, the smoother and better it is filed the less paper will it require. To get the beautiful finish we see on the best work, a piece of flour emery paper, well worn, and a little oil upon it, will be found the best thing to use, and when this has been well worked, to get the high polish, a piece of wood flat upon the surface, with some fine crocus, will bring it up to this state; and if any deep scratches be there, you will at once observe them, and to remove them, in all probability, it will have to be filed all over again. Now, to avoid all this

loss of time, great care must be taken that the scratches are removed before any attempt is made to polish. Having finished the work so far, many prefer to see it left straight; others, again, like to see it in some way ornamented. Now, there are several ways of doing this. First, then, to cross the surface. This is done by folding a piece of emery paper tightly round a file, but the process is not the merely pushing it across the work and making a mark, but it requires some practice to produce a good pattern, and the wrist must take a kind of circular action, and by doing this each line becomes, so to speak, connected, and makes a much better finish than a series of lines only. Another process of finishing steel is to curl all over the surface with a piece of oil stone that will cut. This is a most difficult thing to obtain, as very few stones will cut steel to leave the bright marks necessary to give it the appearance desired. When a piece of this is once obtained it is really a prize, and if it wears away it may be inserted as far as possible into a wooden handle. To use the stone when it is once obtained is the next thing. This is done by holding it firmly in the hand and moving it about in all directions, like curling brass. There is no stated number or size of the curl, but this is quite a matter of taste and must be left to the operator. Another way of finishing iron and steel is with the scraper, which is used with both hands, and the work must be scraped in various directions, but with regularity. Large surfaces are sometimes done in this way. Lathe beds are at times done so, but we think this is somewhat out of character, as the fact of continually drawing the poppit head up and down the bed produces a series of lines which looks most unsightly. Regarding all this, it is all a matter of taste, and the style of finish must be left to the operator.—*Forge and Lathe.*

Polishing Agents for Metals.—Polishing (Putz) Soap.—1. Stir into 37½ lb. of liquid cocoanut oil soap 3 lb. of tripoli and 1½ lb. each alum, tartaric acid, and white lead.

2. Cocoanut oil, 40 lb., stirred into 20 lb. of lye of 38° to 40°. When the mixture is bright add 5 lb. colcothar, mixed with 5 lb. of water. Put in finally 2 oz. 1 drm. of spirit of sal ammoniac.

3. Shave finely 11 lb. cocoanut soap, add some water and melt. Add 13 oz. 2 drms. of chalk; 6 oz. 4 drm. each of alum, tartaric acid and white lead. Stir vigorously.

Polishing Powder.—1. Carbonate magnesia, 5 lb.; calcium carbonate, 5 lb.; ferric oxide, 8¾ lb.; mix thoroughly.

2. Carbonate magnesia, 5 lb.; elutriated colcothar, 6 oz. 7 drm.

3. A very useful polishing powder for metals and glass is made of very finely ground glass mixed with a small proportion of dried soda ash.

Metals.—1. The method generally employed by machinists in grinding and polishing either new or old work is to mix the polishing material with oil, usually refuse machinery oil; in most cases this is a great mistake, and has caused the loss of time, patience and money. Take, for instance, the grinding to a true bearing of a stopcock, a valve seat, or a slide valve. There are few machinists but what have had more or less of that class of work to do, particularly in jobbing shops, and we seldom find one who uses the same method of accomplishing the job that is practiced in shops where that class of work is made a specialty. In fitting and grinding the plug into the barrel of a cock, a little judgment and care will save a great deal of hard labor, and in no case should oil be mixed with any of the grinding material, for the following reasons: If fine emery, ground glass, or sand is used with oil, it requires but a few turns of the plug in the barrel to break up the grains of the grinding material into very fine particles; the metallic surfaces also grind off, and the fine particles of metal, mixing in with the grinding material and oil, make a thick paste of the mass. At this stage it is impossible to grind or bring the metallic surfaces to a bearing, as the gluey paste keeps them apart; if more grinding stuff is applied, it will prevent the operator from seeing what part of the barrel and plug bears the hardest. Again, if the grinding material be distributed over the whole surface, the parts that do not bear will grind off as fast as the parts that touch hard, as the particles work freely between the surfaces; should the barrel and plug bear equally all over when fitted, it requires more care than if it were a top or bottom bearing, as that part of the barrel and plug across the waterway grinds twice as fast as the other parts; therefore it should be kept the driest. Now this objection holds good in the grinding of valve seats or slide valves, to wit: the separation of the surfaces of the metal by a thick, pasty, grinding material. In order to bring the surfaces to a perfect bearing rapidly and with little labor, the following directions will be found worth a trial: To grind a stopcock of any kind, first see that the plug fits the barrel before it is taken from the lathe. Run a half round smooth file up and down the barrel to break any rings that may be in it; a few rubs of a smooth file back and forth over the plug will break any rings or tool marks on it. Wipe both parts clean. Use for grinding material fine moulders' sand sifted through a fine sieve. Mix with water in a cup, and apply a small quantity to the parts that bear the hardest. Turn rapidly, pressing gently every few turns; if the work is large and the lathe is used, run slowly; press and pull back rapidly to prevent sticking and ringing; apply grinding sand and water until a bearing shows on another part, then use no more new sand, but spread the old that has worked out over the whole surface. Turn rapidly, pressing gently while turning; withdraw the plug and wipe part of the dirt off, and rub on the place a little brown soap; moisten with water and press the surfaces together with all the force at hand, turning at the same time. Remove the plug and wipe both parts clean; next try the condition of the bearing by pressing the dry surfaces together with great force. If the parts have been kept closely together while grinding, and the plug has not rubbed against the lower part of the barrel, the surfaces will be found bright all over and a perfect bearing obtained. If an iron barrel and a brass plug are used, or two kinds of brass, a hard and soft metal, soap should be used freely when finishing up, as the tendency to form rings is greater when two different metals are used.

2. In grinding a slide valve which has been in use until hollow places have worn in the surface, emery mixed with water, or sand and water, will be found better than oil, unless a light body of oil, such as kerosene, is used. If water is used with the grinding material, soap should be rubbed on hollow places, and the grinding stuff should be applied to the high parts in small quantities, keeping the low parts clean and dry until an even surface is obtained all over; then the worn out stuff should be used for finishing up. In polishing metal, oil that will gum up should not be used with the polishing material unless for a dead fine polish.

3. In polishing old brass work which has been scratched and tarnished by wear, pumice or bathbrick should be used with soap and water for scouring off with, and rottenstone with kerosene oil for the wet finish, and dry for the final polish. The same method should be used for new brasswork. New work should require, after leaving the lathe and vise tools, but little polishing or grinding, and every good workman should try to avoid using an emery stick or emery cloth, as with proper care in the use of tools a great deal of grinding and polishing can be dispensed with. The polishing of metals varies somewhat according to their

character, but the main principal underlying all is the substitution of progressively finer scratches for those left by the material last used, until they become so delicate as to be invisible without the aid of a microscope.

Nails, to Polish. See **Nails.**

Nickel, Paste for Polishing.—Use chalk mixed with tallow.

Nickel Plated Goods, to Clean.—1. Ordinary rouge is used by nickel platers. The following is excellent: Take equal parts of precipitated iron carbonate and prepared chalk, or take quicksilver with chalk ½ oz., and prepared chalk 2 oz.; mix them. When used, add a small quantity of alcohol, and rub with chamois leather.

2. Rouge with a little fresh lard or lard oil, on a wash leather or piece of buckskin. Rub the bright parts, using as little of the rouge and oil as possible; wipe off with a clean rag slightly oiled. Repeat the wiping every day, and polishing as often as necessary.

Polishing Powder, the Parisian.—Mix together 5 parts jewelers' red and 30 parts carbonate of magnesia. Use with alcohol.

Pearl, to Polish.—Add olive oil to finely pulverized rottenstone, so as to make a thick paste. Then add sulphuric acid in sufficient quantity to make a thin paste. Apply this paste and rub quickly with a cork covered with velvet, and, as soon as the pearl takes the polish, wash off. This is a fine polish.

2. Go over it with pumice stone finely powdered, washed to separate the impurities and dirt, with which polish it very smooth; then apply putty powder and water by a rubber, which will produce a fine gloss and good color.

Pewter.—The burnishing of pewter articles is done after the work has been turned or finished off with a scraper. The burnishers are of different kinds, for burnishing articles either by hand or in the lathe; they are all of steel, and while in use are rubbed with putty powder on leather, and moistened with soapsuds.

Piano Keys, to Polish.—The frame would not hold the keys sufficiently level or firm. A better way would be to hand screw a few at a time on a board, and scrape them in that position. They should be finished with flour paper, care being taken that they do not get too hot during the process. Unless the keys are very hollow or much discolored, it would perhaps be better to dispense with the scraper altogether, using a coarser glasspaper in its stead. They should be polished singly, on a board covered with several thicknesses of cloth; this should be placed on a bench, and the ivories vigorously rubbed, lengthwise and face downward, until a good polish is obtained. Putty powder is the best polishing material, though pumice might first be used to take out any marks left by the paper. A very brilliant polish may be got by finishing the keys with a similar board covered with wash leather, and sprinkled with rouge. A liberal supply of water is necessary during the process.

Plaster of Paris Work, to Polish.—Add to the gypsum 1 or 2% of alum, sulphate of potash or borax. The gypsum will set slowly, and is capable of receiving a high polish.

Plate Powders.—1. Take equal parts precipitated subcarbonate of iron and prepared chalk.

2. An impalpable rouge may be prepared by calcining the oxalate of iron.

3. Take quicksilver with chalk, ½ oz., and prepared chalk, 2 oz.; mix them. When used, add a small quantity of spirits of wine, and rub with chamois leather. Not recommended.

4. Put sulphate of iron into a large tobacco pipe; place it in a fire for a quarter of an hour; mix with a small quantity of powdered chalk. This powder should be used dry.

5. The following makes a liquid polish for silver plate: Three to 4 drm. cyanide of potassium, 8 to 10 grn. nitrate of silver, and 4 oz. of water; apply with a soft brush, wash the object thoroughly with water, dry with a soft linen cloth, and polish with chamois skin. Neither whiting nor powder of any kind should be used for cleaning and polishing—they only waste and scratch the silver.

6. Take 2 oz. hartshorn powder and boil it in 1 pint water; soak small squares of damask cloth in the liquid, hang them up to dry, and they will be ready for use, and better than any powders.

7. Add by degrees 8 oz. prepared chalk in fine powder to a mixture of 2 oz. spirits of turpentine, 1 oz. alcohol, ½ oz. spirits of camphor, and 2 drm. aqua ammonia; apply with a sponge, and allow it to dry before polishing.

8. Mix together 1 oz. fine chalk, 2 oz. cream of tartar, 1 oz. rottenstone, 1 oz. red lead, and ¾ oz. alum; pulverize thoroughly in a mortar. Wet the mixture, rub it on the silver, and, when dry, rub off with a dry flannel, or clean with a small brush.

9. An excellent preparation for polishing plate may be made in the following manner: Mix together 4 oz. spirits of turpentine, 2 oz. 90% alcohol, 1 oz. spirits of camphor, and ½ oz. spirits of ammonia. To this add 1 lb. whiting, finely powdered, and stir till the whole is of the consistency of thick cream. To use this preparation with a clean sponge, cover the silver with it, so as to give it a coat like whitewash. Set the silver aside till the paste has dried into a powder; then brush it off, and polish with chamois leather. A cheaper kind may be made by merely mixing 90% alcohol and whiting together.

French Plate Powder.—1. Mix jewelers' rouge with carbonate of magnesia, 1 to 12.

2. Putty powder finely powdered, 2 oz.; levigated chalk, 10 oz.

3. Equal parts common salt, alum, cream of tartar; dissolve in hot water and boil the plate in it.

Putz Pomade.—1. In 100 lb. common yellow vaseline, melted, stir 20 lb. of fine colcothar.

2. Same as above, only using lard instead of vaseline.

3. 20 lb. of Am. mineral oil and 5 lb. of lard are melted and 25 lb. of fine colcothar are stirred in.

4. The following is given as the formula for genuine putz pomade:

Oxalic acid	1 part.
Oxide of iron	25 parts.
Rottenstone	20 parts.
Palm oil	60 parts.
Vaseline	4 parts.

The oxide of iron may be Venetian red. Both it and the rottenstone must be absolutely free from grit. Oxalic acid is poisonous.

Quartz, etc., Polishing.—To get a fine polish on such stones as quartz, granite, etc., grind the surface on a grindstone, the last grinding being very light, and then rub with ground pumice stone and water on the end of a piece of wood or on a piece of sole leather, finishing with a piece of sole leather with oxide of tin or rouge, wet. The same process will answer for polishing geological specimens, such as coral, onyx, jasper, etc. A piece of felt or heavy woolen cloth tacked on a board also makes a good polisher. An ordinary lapidary's outfit consists of appliances not usually kept on sale, but which any machine shop can readily furnish. You will need a frame with wheel shaft and spindle, with several lead laps, one for coarse and one for fine emery, and one or more for polishing, also a lap made with end wood on a chuck for polishing, and a leather polisher, desirable for rounded work. A thin disk of copper mounted on ordinary lathe spindle is used for slitting with emery. In using diamond dust, which is employed in working on diamonds, and in some other cases, a sheet steel disk, very thin, should be used.

Rags, Polishing.—Saturate woolen stuff with a solution composed of 3 oz. 4 drm. of Castile soap dissolved in 14 oz. water. To this solution add 22 drm. tripoli. Color with coralline.

Shells, to Polish.—1. Boil in a strong solution of potash; then polish with hydrochloric acid and putty powder.

2. Clean the surface with hydrochloric acid until the outer skin is removed. Wash in warm water, dry in sawdust and polish with chamois skin. If the shell is destitute of natural luster, rub with tripoli powder and turpentine applied with a chamois skin, and finally finish with olive oil.

See also Tortoise Shell.

Shells, to Prepare and Polish.—1. Porcelainous shells are so hard as to require the apparatus of a lapidary to cut or polish them, but they are generally so smooth as to require no rough grinding. They may be polished by using a felt wheel and applying putty powder. Nacreous shells or those of the pearl variety may be filed and cut without a great deal of difficulty. Pieces to be turned are first roughly shaped on the grindstone, then turned and polished with pumice stone, putting on the final polish with rottenstone. Irregularly shaped pieces are filed and ground, then smoothed with pumice stone and water, and finished with rottenstone. The rottenstone is sometimes mixed with sulphuric acid full strength, or slightly diluted, to heighten the polish.

2. Rough shells are polished by first grinding them on a coarse stone, then smoothing them with pumice stone and water on a buffer wheel or with a hand polisher, and finishing with rottenstone.

Show Cases, to Polish.—A good polishing powder consists of rock alum, burned and finely powdered, 5 parts; levigated chalk, 1 part; mix. Apply with a dry brush.

Silver Plated Ware, Polish for.—1. Dissolve 2 drm. potassium cyanide and 5 grn. silver nitrate in 2 oz. water. Apply with a soft brush; dry with a cloth and with chamois skin.

2. A thin coating of collodion may be used to prevent tarnish where silver is to be stored for any length of time.

Silverware, to Clean.—Use any of the powders given below or the liquid polishes also given. It should be remembered that every polish removes a portion of silver, so that cleaning should be resorted to only when absolutely necessary. See also **Soaps,** *Silver.*

1. Caustic ammonia, 5 parts; water, 200 parts; sodium hyposulphite, 20 parts; ammonium chloride, 10 parts.

2. Sodium hyposulphite has been recommended by Messrs. Tiffany & Co. Use with water.

3. Have ready a basin containing equal parts oil of vitriol and water, make the article white in a gas flame (not white heat, but a snowy white, which it will assume after exposure to the flame), then plunge it into the pickle, and there leave it for one half hour, then dry in box dust. Applies to solid ware only.

4. Heat to a dull red (if there is no lead present), allow to cool, and when cold boil in a pickle of water acidulated with sulphuric acid (30 water, 1 acid) until perfectly white; take out, swill in clean water, and burnish the prominent parts; dry in hot boxwood sawdust.

5. Commence by cleaning off any kind of dirt which the surfaces of the silver articles had contracted while making, as that would entirely spoil the burnishing. For this purpose, take pumice powder, and with a brush, made very wet in strong soapsuds, rub the various parts of the work, even those parts which are to remain dull, which, nevertheless, receive thus a beautiful white appearance; wipe with an old linen cloth, and proceed to the burnishing.

6. A few drops of nitrobenzol are added to 40 parts vaseline (common); 50 parts of whiting are now stirred in together with 10 of burnt hartshorn and 10 parts of very finely powdered cuttlebone; mix thoroughly.

7. Finest whiting, 15 parts; soda, 1½ parts; citric acid, ⅜ part. Reduce to a fine powder. Use by moistening the powder with water.

8. Use a burnisher; wet with soap-water. Silver can also be polished with Vienna lime.

9. Silver Polishing (Putz) Pomade.—Mix thoroughly 4½ parts vaseline with a few drops of essence of mirbane (nitrobenzole). Add to this by stirring 7½ parts elutriated chalk, 1½ parts burnt hartshorn, 1½ part pulverized *ossa sepia* (cuttle bone). The mixture should be of the consistency of butter.

10. Half lb. fine chalk, 3 oz. pipe clay, 2 oz. white lead, ¾ oz. magnesia (carbonate), and the same quantity of jeweler's rouge.

Silver Soap.—11. A good article may be made as follows:

Hard soap	8 oz.
Turpentine	1½ oz.
Water	4 oz.

Boil until perfectly dissolved and add—

Liquor of Ammonia	3 oz.

12. Silver Soap (English).—Dissolve 10 parts fine Castile soap in 10 parts water. Remove from the fire and stir in 30 parts fine whiting.

2. Prepare the same as the above, using instead of the whiting 10 parts tripoli, 5 parts of rouge, 15 parts of pulverized chalk.

Slate Polishing.—Slate is faced first with an iron plate with river sand and water, smoothed with pumice stone; then japanned and baked to harden the japan, and again smoothed with pumice stone and polished with rottenstone.

Soaps, Polishing.—1. Mix 1 lb. oxalate of iron (calcined) with 5 lb. cocoanut oil soap.

2. Ten lb. tripoli, 5 lb. of alum, 5 lb. white lead, tartaric acid, 5 lb., and 100 to 125 lb liquid cocoanut oil soap.

Specula, Polishing Powder for (Lord Ross).—Precipitate a dilute solution of sulphate of iron, by ammonia in excess; wash the precipitate, press in screw press until nearly dry, then expose to heat until it appears a dull red color in the dark.

Steel, to Polish. See *Iron and Steel* above.

Steel, to Polish.—Wet Vienna lime to a paste. Apply to buff, and finish dry.

Steel, Glaze Wheels for Finishing.—For hollow finishing, the following wheels are required: A mahogany wheel for rough glazing. A mahogany wheel for smooth glazing. A lead wheel, or lap. For flat finishing: A buff wheel for rough. A buff wheel for smooth. A buff wheel for finishing. Lastly, a polisher. To make the glaze wheels: Get the spindles, and point them on each end; then get a block of beech and wedge it on the steel at one end with iron wedges; and turn it for the pulley for the band to run on. Take two pieces of flat mahogany and glue and screw them together, so that the grain of one piece crosses the other, to prevent warping. Let it get thoroughly dry, and wedge it on the spindle and turn it true. The lead wheel is made the same way but wider, and has a groove turned in the edge. The wheel is put into sand, and a ring of lead run round the edge; it is then turned true. To make the buff wheels, proceed as with the glaze; but to save expense, pine or deal wood will do as well as mahogany, only leave it about double the width of the glaze, which is about ½ in. wide by 12 or 14 in. across. The buff wheels are covered with glue, and then the leather is tacked on with tacks driven in about half way, so that they may be easily drawn out again. The leather is then turned true. The polisher is made the same way, but the size of the polisher must be a little less than any of the other wheels, say about 1 in. The buff wheels are dressed by laying on a fine thin coat of clear glue, and rolling them round —No. 1, in superfine corn emery; No. 2, in smooth emery; No. 3, by making a cake of equal parts of mutton suet, beeswax, and washed emery; then it is held on the wheel while it is going round. The glaze wheels are dressed while using, by mixing a little of the emery with oil, and putting it on the wheel

with a stick or the finger. The leather of the polisher is not covered with glue, but dressed with a mixture of crocus and water, not oil. Care must be taken to keep each wheel and substance to themselves; the work must be carefully wiped after each operation, and cleanliness must be studied above all things in using the polisher, as the slightest grease getting on it stops the polishing.

Stones, to Cut and Polish.—You will need a thin copper disk about 6 in. diameter, made to revolve rapidly on a spindle. With No. 90 to 100 emery and water liberally fed to the wheel, you will be able to slab any specimens of rocks or minerals of ordinary hardness. You will also need a grindstone to flatten the surfaces for polishing. A lap of lead is used with fine emery, and another of wood faced with leather or felt fed with a cream of rouge and water. The laps should run at a speed of 150 and may be 10 or 12 in. diameter, the specimens being held on their face with the hand. For a less expensive arrangement for surfacing only a good stone and a piece of sole leather nailed to a board, with the whole manipulation made by hand, will make satisfactory work with amateurs.

Surfaces, Polishing Finished.—Oil is usually employed for polishing delicate instruments, which tends to soil those using them. Oil may be advantageously replaced by a mixture of three parts of glycerine and one of alcohol for large surfaces. When small ones are to be treated, pure glycerine can be used.—*Revue Scientifique.*

Tin, to Polish.—1. Vienna lime applied with a linen rag.

2. Use whiting and water with a chamois skin.

3. A fine finish can be given to tin by burnishing, the burnisher being wet ox-gall diluted with water. Wash with water containing a trace of tartar and dry.

Tortoise Shell.—Having scraped the work perfectly smooth and level, rub it with very fine sand paper or Dutch rushes; repeat the rubbing with a bit of felt dipped in very finely powdered charcoal with water, and lastly with rottenstone or putty powder, and finished with a piece of soft wash leather, damped with a little sweet oil; or still better, rub it with subnitrate of bismuth by the palm of the hand.

Vulcanite, Polishing.—1. Remove scratches with a smooth wet water of Ayr stone, and then polish in the lathe with fine pumice and a stiff brush. After washing the pumice off, polish it with whiting and soft brush.

2. The mathematical instrument makers treat it as brass—that is, for flat work they first use water of Ayr stone, and then rottenstone and oil. Turned work is polished in the lathe with rottenstone and oil, taking care not to use too high a speed, which would heat the work. Some use lampblack and oil to finish with where a very high polish is wanted, or the bare palm of the hand, as in getting up silver plate. Chain and ornament makers use circular buffs for their flat work, made of sea horse leather, and for work of irregular forms, buffs of calico.

Water Polishing.—Whiting, 9 oz. 5 drm.; alcohol, 1 lb.; ammonia, 1 oz. 3 drm. Shake well together.

Wheels, Polishing.—Turn some wood wheels of various sizes, and cover them on the face and edge with leather of various qualities; wash leather for use with rouge and a coarser kind for use with emery, pumice, etc. The leather can be fastened with glue. The best wheels are made by punching disks of leather, cloth, etc., and then screwing these disks tightly together on a mandril; but these take a large quantity of material. Some things can be polished very well with plain wood wheel. Small glass grinding jobs, for instance, can be easily polished with two wood wheels, one for pumice and water and another for rouge and water. Make your wheels size and shape to suit the work you have in hand. A few circular brushes are very useful.

Window Polishing Paste is made of 90 parts prepared chalk, and 5 parts each of white bole and Armenian bole, rubbed together into a smooth paste with 50 parts water and 25 parts alcohol. This paste is to be rubbed on the window, allowed to dry, and then rubbed off with cloths.—*Pharm. Era.*

Polishing Wood.—1. Polishing Black Woodwork.—Procure 2½ oz. 90% alcohol, 1 dr. oil of almonds, 1 dr. gum elemi, ½ oz. orange shellac, pounded fine and put together in a bottle to dissolve; when dissolved rub on with white wadding.

2. Orange shellac, 2 oz.; wood naphtha, ½ pt.; benzoin, 2 dr. Mix and put in warm place for a week and keep the materials from settling by shaking it up. To apply it, after having prepared your wood by rubbing some raw linseed oil into it and then wiping it well off again, make a rubber of cotton wool and put some old calico over the face, and till you have a good body on your wood keep the rubber well saturated with polish. When your rubber sticks, put a very little linseed oil on and rub your polish up. Allow it to stand a few hours and give it another coat, using rather more linseed oil on your rubber, so as to get a finer polish. Then let it stand again and finish off with spirits of naphtha, if you can; if not, add a small quantity of polish to your spirit.

Carved Cabinet Work.—Dissolve 2 oz. seed lac and 2 oz. white resin in 1 pt. 90% alcohol. This must be laid on warm, and if the work can be warmed also, it will be so much the better; at any rate, moisture and dampness must be avoided. Used with a brush for standards or pillars of cabinet work. The carved parts of cabinet work are also polished thus: Varnish the parts with the common wood varnish, and having dressed them off where necessary with emery paper, apply the polish used for the other parts of the work.

Polish for Fine Carved Wood.—Take 8 oz. linseed oil, 8 oz. old ale, the white of an egg, 1 oz. spirit, 1 oz. hydrochloric acid. To be well shaken before using. A little is to be applied to the face of a soft linen pad and lightly rubbed for a minute or two over the article to be restored, which must afterward be polished off with an old silk handkerchief. This will keep any length of time, if well corked.

Copal Polish.—Melt with gentle heat finely powdered gum copal, 4 parts, and gum camphor, 1 part, with ether to form a semi-fluid mass, and then digest with a sufficient quantity of alcohol.

For Darkening Furniture.—1. One pint linseed oil, 1 oz. rose pink, 1 oz. alkanet root, beaten up in a metal mortar; let the mixture stand for a day or two; then pour off the oil, which will be found of a rich color.

2.—Or, mix 1 oz. alkanet root with 4 oz. shellac varnish, 2 oz. turpentine, 2 oz. scraped beeswax and 1 pt. linseed oil; this should stand a week.

Polishing Deal.—1. To as much yellow ocher as you can take in your hand add ½ teaspoonful of Venetian red. Mix to the thickness of paint (or rather thinner) with glue size. Let the mixture simmer for some time in a pan, keeping it well stirred. Apply with a brush, and when dry run it over with fine sandpaper and polish with French polish, or, if preferred, turpentine and beeswax. If a deeper color is required, add more Venetian red.

2. Melt about ½ lb. Russian glue in 1 qt. water; grind in some Venetian red until sufficiently colored; give the wood a coat with a brush when dry.

Ebony, to Polish.—Give the work two coats of fine copal varnish and rub this down (when dry) quite smooth with fine pumice stone; put on a third coat of the same and rub down with rottenstone; clean and put on a flowing

coat of best spirit copal varnish, and when this has become quite dry, polish with chamois skin and the palm of the hand.

Ebony.—Add ¼ oz. best drop black to ½ gill French polish. A little of the drop black may be used on the inside rubber, but covered twice with linen rag.

To Put an Egg Shell Polish on Wood.—Three parts shellac, 1 part gum mastic and 1 part sandarac gum dissolved together in 40 parts alcohol form a beautiful polish; apply with brush or rag.

Black and Gold Work.—1. The work to be polished and gilt must be stained with black stain; when quite dry, give a very weak solution of glue size, sandpaper smooth. Care must be used not to remove the black stain with the paper. The part to be gilt must not be touched with the size, or the gold will not adhere so well; polish the part not to be gilt according to directions given for French polishing, using the black polish drop black; when the work is polished ready for spiriting off, lay the work on a table in a warm room, procure a portion of the best oil gold size, pour in a cup; with a very fine stiff brush lay a thin even coat of gold size on the work, let the gold size dry for two hours till it becomes tacky; then having the gold leaf ready, with great care lay a leaf (or part of a leaf, as required) on the cushion, cut to size required with the tip; lay the gold leaf on the sized work; then with a pad made of white wadding press the gold leaf in the crevices, blow off surplus leaf; let it stand aside to dry; when quite dry, polish gently with a very smooth bone, pointed (or a dog's tooth is best), fixed in a handle. Surplus parts and the edges should be cleaned off evenly afterward. Finish the black work off with spirits. Very fine crevices may have gold leaf rubbed in with a brush, if used carefully, then blow off surplus parts. For commoner work, gold paint laid on with a brush answers very well.

2. White and Gold.—Brackets, console tables, whatnots, chairs, and other furniture, are frequently done in white and gold. The grain of the wood should first be filled in with whiting and glue size, one or two coats well papered off and white polished, but the wood should not be finished off with spirits until gilt, leaving the last coat to be done when the gilding is finished; the gilding is done as in 1.

3. A cheaper mode, and much easier for the amateur: First well clean the article (if not new) with soda and water; when dry, scrape and smooth all over, stop up cracks with white lead and driers, one of driers to two of white lead; mix some good white paint made of turps, driers, and white lead, not oil. Give the article three coats, rubbing down the first coat when dry with pumice and water; when the third coat of paint is quite dry, proceed to gild as before described, using either gold leaf or gold paint; when so done, give the gold a coat of transparent enamel varnish, after which varnish the white work with clear copal varnish. Give the work two coats; it will set in a day. Small boxes and other fancy articles may be done by this process.

4. One pt. linseed oil, 1 oz. alkanet root, ¼ oz. rose pink, boil for ¼ hour, strain through muslin so that the oil may be clear; to use it pour a little oil on flannel; rub briskly. After two or three applications, the effect will be apparant.

5. One pt. best vinegar, 1 pt. linseed oil, 2 oz. gum arabic finely powdered; mix in a clean bottle for use. Requires no rubbing, merely laying on with a clean rubber of flannel.

6. One-quarter lb. beeswax melted in an earthenware pot, add gradually ½ pt. turps, colored with ½ oz. alkanet root, add ½ pt. linseed oil; well mix, and keep in wide mouth bottles, for use. The bottles should be kept well corked. To use, wipe the dust from the furniture, apply a portion of the polish on a clean rubber of flannel, rub every part accessible, briskly finish off with an old silk handkerchief. This polish should not be used on new articles; it merely restores a gloss on old polished furniture.

7. One-half pt. rectified wood naphtha, 1½ oz. shellac, ¼ oz. benzoin; crush the gum, mix in a bottle; when dissolved it is ready for use. Keep on a shelf in a warm room until dissolved.

8. Put 2 drm. shellac and 2 drm. gum benzoin into ½ pt. best rectified 90% alcohol in a bottle closely corked; keep the bottle in a warm place and shake frequently until the gums are dissolved; when cold add 2 teaspoonfuls clean poppy oil; well shake it and it is fit for use. This finish can be carefuily laid with a soft rubber or hair brush.

Dry Shining.—This is a new system of polishing or shining called the American system, and is used mostly for American black walnut. First oil, fill in then with a wet rubber passed smartly over the work straight from end to end until a shine or gloss appears. No oil to be used in the rubber, and no spiriting off is required. Be careful to dry rubber well, and have the work free from rubber marks. This system is becoming very popular in the trade.

A Good Polish for Walking Canes and Other Hard Wood.—The following process gives the most satisfactory and hardest finished surface. Fill with best clear filler or with shellac; dry by heat; rub down with pumice; then put on three coats of clear spirit copal varnish, hardening each in an oven at a temperature as hot as the wood and gum will safely stand. For extra work, the first two coats may be rubbed down and the last allowed a flowing coat. For colored grounds, alcoholic shellac varnish with any suitable pigment (very finely ground in) can generally be used to advantage.

French polishing is the name given to the art of coating wood with a fine, smooth, glossy surface or varnish of shellac and various other gums, which are easily soluble in 90% alcohol, methylated spirits, or wood naphtha. A varnish is thus produced, but if it is applied simply with a brush, as copal, mastic, and most other varnishes are applied, the result is a very broken and uneven surface instead of a smooth and continuous polish. To obtain a good polish with a lac varnish on wood it is necessary to apply a very small quantity at once, and to rub it continuously until it dries; when this process has been carefully and properly gone through, the result is a beautiful and even surface, which is not to be surpassed or even equaled by any other means.

Rubbers.—The small pliable rubbers employed for doing carved framework, etc., are usually made of white wadding and the large round ones used for surface work are mostly formed of soft flannel. The latter kind must be firmly made; and the more they possess such qualifications as proper size and solidity, the more quickly and satisfactorily will they polish extensive sufaces.

Rags.—Fine linen makes the best rubber coverings and spiriting cloths, but cheap cotton will answer nearly as well. Both stuffs are preferred after having been used and washed several times. The way to wash them is to boil them first in a strong lye of potash, and then in a week one of soap powder, suffering each boiling to be succeeded by a thorough rinsing in clean water.

Wettings.—Some workmen wet the soles of their rubbers, by dipping into a saucer containing the preparation, and others by holding their bottles upside down, allowing the polish to shower through the drilled punctures of the stopples. Care should be taken not to soak the rubber too much by either means; and after wetting and covering, the sole ought always to be pressed forcibly upon the palm of the hand so as to equalize the moisture.

Rubbings.—Invariably on beginning with a newly wetted rubber, gently and regularly sweep the surface from end to end in the run-

ning direction of the fiber three successive times; then rub across the grain with a semi-circular motion, till the polishing tool becomes dry. This operation is of course repeated until the whole surface of the pores is no longer visible. The work so treated is now to be left in a clean apartment for a period of twelve hours, this being the time required for the complete absorption of the first body.

The sinking period having expired, the work is smoothed, dusted, etc., and then the polishing of it is recommenced. The first sweepings are similar to those described in the preceding embodying, after which ply the rubber wholly with a rotatory movement, leaning lightly on it at first, and slightly increasing the necessary pressure toward the drying of it, which is finally accomplished by sweeping once or twice along the grain, expressly to remove any marks that may have been caused by the cross or round rubbings.

In these manipulations it is much better to use freely extended motions than contracted ones; therefore the mechanical movements of the arm must on no account be confined.

Wipe all the dust off your work at each recommencement. Allow every embodying a proper time to absorb and harden, previous to the reapplication of smoothing stuffs or polishes. Cover your rubber with a clean part of the rag at each wetting. Carefully guard against working your implement too long in one direction, and leaning too heavily on it when it is very wet, else you will be apt to produce coarse marks and streaky roughness.

Rubber marks may be removed by their being reversely rubbed with a heavily pressed half dry rubber.

In polishing a very large surface, such as the top of a dining table, do only one-half at a time.

In spiriting, the finishing spirit should not be used in excess, because it dissolves a portion of the resinous or gummy body, and thereby causes dimness instead of brightness. If, however, the spirit be slightly mixed with polish, and be sparingly and judiciously employed, the desired clearness of luster will make itself apparent. Prior to the application of the spirit cloth, which consists of a few soft rags loosely rolled up in the shape of a large finger rubber and slightly damped with spirit, it is most essential to ply the rubber more quickly, and a little longer than ordinary, for the purpose of removing all signs of moisture and greasiness from the surface of the gloss.

Most polishers seem to think that nothing can be more productive of transparent brilliancy and durable hardness at the finish than the moderate use of spirit that has been somewhat weakened by exposure to the air, and an allowance of two hours as a resting period between the final embodying and the spiriting.

Directions for Repolishing: In order to apply this process with facility, you will find it needful to disunite the various parts of each article. If your job be a wardrobe, take off the doors by unfastening their hinges; remove all the screw nails; take off the cornice; lift the wings or carcases from the base; and then separate the mouldings and other carved ornaments from the frames and panels of the doors. If it be a chest of drawers, pull the drawers out; unscrew the knobs or handles; remove the scutcheons from the keyholes; free the columns or pilasters from their recesses, and lift the carcase from off the base. If your job should happen to be a sideboard, separate the upper back from the top, unscrew the under back, and then take the base, top and pedestals asunder.

After having disjoined the different portions and ornaments, take a pencil and put tallying marks on every two meeting sides; this will guide you in having everything appropriately replaced, when the complete article is finished.

The viscid rust must be thoroughly removed from the surface of the work; this is done by scrubbing it with a paste made of the finest emery flour and spirits of turpentine.

After cleansing and before repolishing, it is a good plan to merely moisten the face of the work with raw linseed oil, for this causes the old body to unite with the new one.

Where shallow dents, scratches and broken parts of the polish present themselves, carefully coat them two or three times with a thick solution of shellac, and when the last coatings become hard rub them with soft putty until they become uniformly smooth and even; then proceed to polish the general surface.

The following are receipts for furniture creams or French polishes:—1. One pint 90% alcohol, ¼ oz. gum copal, ¼ oz. gum arabic, 1 oz. shellac. Bruise the gums and sift them through a piece of muslin. Place the spirits and gums together in a vessel closely corked, near a warm stove, and frequently shake them; in two or three days they will be dissolved. Strain through a piece of muslin, and keep corked tight.

2. Shellac, 6 oz.; naphtha, 1 qt.; benzoin, ¾ oz.; sandarac, 1 oz.

3. Dissolve 1½ oz. shellac, ¼ oz. sandarac, in ½ pt. naphtha. To apply the polish, fold a piece of flannel into a sort of cushion, wet it well with the polish, then lay a piece of clean linen rag over the flannel, apply 1 drop of linseed oil; rub your work in a circular direction, lightly at first. To finish off, use a little naphtha, applied the same as the polish.

4. Pale shellac, 2¼ lb.; mastic and sandarac, each 3 oz.; spirits, 1 gal. Dissolve, and add copal varnish, 1 pt.; mix well by agitation.

5. Shellac, 12 oz.; wood naphtha, 1 qt.; dissolve, and add ½ pint linseed oil.

6. Crush 3 oz. shellac with ½ oz. gum mastic, add 1 pt. methylated spirits of wine, and dissolve.

7. Shellac, 12 oz.; gum elemi, 2 oz.; gum copal, 3 oz.; spirits of wine, 1 gal.; dissolve.

8. Shellac, 1¼ oz.; gum juniper, ½ oz.; benzoin, ½ oz.; methylated alcohol, ½ pt.

9. One oz. each of gums mastic, sandarac, seed lac, shellac, and gum arabic; reduce to powder, then add ¼ oz. virgin wax; dissolve in a bottle with 1 qt. rectified spirits of wine. Let stand for twelve hours, and it is then fit for use.

10. One oz. gum lac, 2 drm. mastic in drops, 4 drm. sandarac, 3 oz. shellac, ½ oz. gum dragon. Reduce the whole to powder.

11. Yellow wax, 4 oz.; yellow soap, 2 oz.; water, 50 oz.; boil, with constant stirring, and add boiled oil and oil of turpentine, each 5 oz.

12. Soft water, 1 gal.; soap, 4 oz.; white wax, in shavings, 1 lb. Boil together, and add 2 oz. pearlash. To be diluted with water, laid on with a paint brush, and polished off with a hard brush or cloth.

13. Wax, 3 oz.; pearlash, 2 oz.; water, 6 oz. Heat together, and add 4 oz. boiled oil and 5 oz. spirits of turpentine.

14. Raw linseed oil, 6 oz.; white wine vinegar, 3 oz.; methylated spirit, 3 oz.; butter of antimony, ½ oz.; mix the linseed oil with the vinegar by degrees, and shake well so as to prevent separation; add the spirit and antimony, and mix thoroughly.

15. Boiled linseed oil, 1 pt.; yellow wax, 4 oz.; melt, and color with alkanet root.

16. Acetic acid, 2 drm.; oil of lavender, ½ drm.; rectified spirit, 1 drm.; linseed oil, 4 oz.

17. Linseed oil, 1 pt.; alkanet root, 2 oz.; heat, strain, and add lac varnish, 1 oz.

18. Linseed oil, 1 pt.; rectified spirit, 2 oz.; butter of antimony, 4 oz.

French Polish Reviver.—1. Linseed oil, ½ pt.; spirits of camphor, 1 oz.; vinegar, 2 oz.; butter of antimony, ½ oz.; spirt of hartshorn, ¼ oz.

2. One-half gill vinegar; 1 gill spirits of wine; 1 drm. linseed oil.

3. Naphtha, 1 lb.; shellac, 4 oz.; oxalic acid, ¼ oz. Let it stand till dissolved; then add 3 oz. linseed oil.

Furniture Polish.—1. If the work is full of pores, you should give it a coat of clear size before commencing with the polish, and, when dry, go gently over it with very fine glass paper. The size, by filling up the pores, will prevent both the waste of polish, which would otherwise be absorbed in the wood, and save considerable time in the work. You should place your work in such a situation that the light may shine on it obliquely, so that by looking sideways you may be able to see how the polishing proceeds. Make a wad with a piece of coarse flannel, or drugget, by rolling it round and round, over which, on the side you mean to polish with, put very fine linen rag doubled several times to render it as soft as possible; put the wad, or cushion, to the mouth of the bottle containing the polish and shake it, which will damp the rag sufficiently, then proceed to rub your work in a circular direction, observing not to do more than a foot square at a time; rub it lightly till the whole surface is covered, and repeat this operation three or four times, according to the nature of the wood. Be very particular in having your rags clean and soft, as the effect of the polish depends, in a great measure, on its being kept clean and free from dust. Rub each coat till the rag appears dry, and be careful not to put too much upon the rag at once, and you will obtain a beautiful and lasting polish.

2. Melt three or four pieces of sandarac, each of the size of a walnut, add 1 pt. of boiled oil, and boil together for one hour. While cooling add 1 drm. of Venice turpentine, and if too thick a little oil of turpentine also. Apply this all over the furniture, and after some hours rub it off; rub the furniture daily, without applying fresh varnish, except about once in two months. Water does not injure this polish, and any stain or scratch may be again covered, which cannot be done with French polish.

3. The subjoined simple preparation is said to be desirable for cleaning and polishing old furniture. Over a moderate fire put a perfectly clean vessel. Into this drop 2 oz. of white or yellow wax. When melted, add 4 oz. of pure turpentine, then stir until cool, when it is ready for use. The mixture brings out the original color of the wood, adding a luster equal to that of varnish.

4. For delicate cabinet and papier maché work.—

Linseed oil	32	oz.
Spirit	8	oz.
Vinegar	8	oz.
Butter of antimony	2	oz.
Oil of turpentine	8	oz.

Shake well before using, and apply with a woolen rubber.

Oil of turpentine	16	oz.
Rectified oil of amber	16	oz.
Olive oil	16	oz.
Oil of lavender	1	oz.
Tincture of alkanet	4	drm.

Mix.

A cotton rubber is saturated with this polish, which is thus applied to the wood. The latter is then well rubbed with soft, dry cotton rags and wiped dry.—*Meyer Bros.' Druggist.*

5. Melt 3 or 4 pieces sandarac, each of the size of a walnut, add 1 pt. of boiled oil, and boil together for one hour. While cooling add 1 drm. of Venice turpentine, and if too thick, a little oil of turpentine too. Apply this all over the furniture, and after some hours rub it off; rub the furniture daily, without applying fresh varnish, except about once in two months. Water does not injure this polish and any stain or scratch may be again covered, which cannot be done with French polish. This receipt is very highly recommended for use in the household.

6. Melt together 4 parts of paraffine, 1 part of tallow and pour the mixture into a vessel containing hot water. Add 12 parts of oil of turpentine and stir well. Allow to stand until cold.

Polish for Wood, Used without Friction.—Dissolve 4 oz. best shellac in 2 pt. strong alcohol, add 2 pt. linseed oil and 1 pt. spirit of turpentine, shake and add 4 oz. sulphuric ether (common ether) and 4 oz. aqua ammonia. Shake when used and apply with a sponge lightly.

Reviver.—Pale linseed oil, raw, 10 oz.; lac varnish and wood spirit, each 5 oz. Mix well before using.

Imitation Polish for Woodwork.—The wood is first varnished over with gelatine, and after drying and smoothing, with a mixture of 2¼ lb. fluid copal varnish and 4 drm. pure drying linseed oil; after drying the wood is polished with an ethereal solution of wax.

Woods, to Polish, in the Lathe.—Soft woods may be turned so smooth as to require no other polishing than that produced by holding it against a few fine turnings or shavings of the same wood while revolving. Mahogany, walnut, and some other woods may be polished by the use of a mixture as follows: Dissolve by heat so much beeswax in spirits of turpentine that the mixture, when cold, shall be of about the thickness of honey. This may be applied to furniture or to work running in the lathe by means of a piece of clean cloth, and as much as possible should be rubbed off by using a clean flannel or other cloth. Hard woods may be readily turned very smooth; fine glass paper will suffice to give them a very perfect surface; a little linseed oil may then be rubbed on, and a portion of the turnings of the wood to be polished may then be held against the article, while it turns rapidly around, which will in general give it a fine gloss. Also try alcoholic shellac varnish, 2 parts; boiled linseed oil, 1 part; shake well before using. Apply a small quantity with a cloth and rub vigorously until the polish is secured.

Furniture Oils.—1. Take 1 pt. furniture oil, mix with it ½ pt. spirits of turpentine and ½ pt. vinegar; wet a woolen rag with the liquid and rub the wood the way of the grain, then polish with a piece of flannel and soft cloth.

2. Melt 3 or 4 pieces of sandarac, each of the size of a walnut, add 1 pt. boiled oil, and boil together for one hour. While cooling, add 1 drm. Venice turpentine, and if too thick a little oil of turpentine also. Apply this all over the furniture, and after some hours rub it off; rub the furniture daily, without applying fresh varnish, except about once in two months. Water does not injure this polish, and any stain or scratch may be again covered, which cannot be done with French polish.

3. Beeswax, ½ lb.; alkanet root, ¼ oz.; melt until well colored. Then add linseed oil and spirits of turpentine, of each ½ gill, straining through a piece of coarse muslin.

4. The wood having been stained, paper off smooth with No. 0 glass paper enough to give an even surface. Add ½ gill French polish, to ¼ oz. best dragon's blood, well mix and strain through muslin; polish as usual; if wanted very dark, apply a little dragon's blood to the rubber, but the rubber must be covered twice with linen rag.

5. Mix one part of boiled linseed oil with two parts of alcoholic shellac varnish. Shake well before using. Apply in small quantities, with a cloth, and rub the work vigorously until the desired polish is secured.

Pastes for Polishing or Finishing Wood.—1. To keep wood light, scrape ¼ lb. beeswax into ½ pt. turpentine. By adding linseed oil the wood is darkened.

2. Dissolve 6 oz. pearlash in 1 qt. hot water, add ¼ lb. white wax, and simmer for one half hour in pipkin; take off the fire; and when cool the wax will float; it should be taken off, and, with a little hot water, worked into a paste.

3. Beeswax, spirits of turpentine and linseed oil, equal parts; melt and cool.

4. Beeswax, 4 oz.; turpentine, 10 oz.; alkanet root to color; melt and strain.

5. Digest 2 drm. alkanet root in 20 oz. turpentine till the color is imparted; add yellow wax in shavings, 4 oz.; place on a water bath and stir till the mixture is complete.

6. Beeswax, 1 lb.; linseed oil 5, oz.; alkanet root, ½ oz.; melt, add 5 oz. of turpentine. strain and cool.

7. Beeswax, 4 oz.; resin, 1 oz.; oil of turpentine, 2 oz.; Venetan red to color.

8. One lb. white wax; 1 oz. black resin; 1 oz. alkanet root, and 10 oz. linseed oil.

9. One lb. yellow wax, 2 oz. yellow soap, 2 pt. spirits of turpentine, 2 pt. boiling water; melt the wax and soap over a slow fire, add the turpentine, and lastly stir in the water gently till it is quite cold.

10. One and one half lb. beeswax, 4 pt. spirits of turpentine; dissolve in a closed vessel by means of a water bath, and add ½ lb. common soap previously dissolved in 4 pt. water, and stir well together till nearly cold.

11. Five oz. yellow wax, 1 pt. turps, 1½ oz. Castile soap; cut the beeswax in small pieces, and dissolve in the turps by a gentle heat; when nearly cool, add the soap (first powdered and rubbed up with 2 oz. water), stirring continually till it becomes thick.

12. Two and one half oz. yellow wax, 1 oz. white wax, 1 oz. Castile soap, 10 oz. turpentine oil, 10 oz. boiling water, 1 drm. potash carbonate; melt the wax and turpentine together, dissolve the soap and potash carbonate in the water and mix while warm, stirring till cold.

13. Beat 5 lb. stearine out into thin sheets with a wooden mallet, and mix with 7 lb. oil of turpentine, after which subject the mass to a water bath and heap up; when hot, add ½ oz. ivory or bone black, stirring well to prevent crystallization. To cool it off, it should be emptied into another vessel and stirred until cold. To use, warm it until it is reduced to a liquid state, and apply in small quantities with a cloth; afterward rub it well with a piece of silk or linen cloth to bring up the polish.

Furniture Polishes. — The following is a good polish for furniture, to be used upon new wood for hand polishing, in place of French polish, but one that requires constant manual labor, may be made of beeswax and turpentine spirit melted together, with red sanders wood to color it. This has been tried for many years and well repays the trouble attending it. It should not be used upon work that has been French polished, but the following will be found better than most that can be bought for reviving the brilliancy of French polished goods. Take equal parts of turpentine, vinegar, spirits of wine (methylated), and raw linseed oil, and place them in a bottle in the order in which they are mentioned; great care must be taken in this last particular; if not, the mixture will curdle and become useless.—*Smither.*

2. Derby cream is made by adding 6 oz. linseed oil to 3 oz. acetic acid. This is agitated well, and ½ oz. butter of antimony and 3 oz. methylated spirit are added.

3. Soft water, 1 gal.; soap, 4 oz.; beeswax, in shavings, 1 lb. Boil together, and add 2 oz. pearlash. To be diluted with water, laid on with a paint brush, and polished off with a hard brush or cloth.

4. Wax, 3 oz.; pearlash, 2 oz.; water, 6 oz. Heat together, and add 4 oz. boiled oil and 5 oz. spirits of turpentine.

5. The name is sometimes given to a mixture of 1 oz. white or yellow wax with 4 oz. of oil of turpentine.

6. Rain water, 1 gill; spirits of wine, 1 gill; beeswax, 1 oz.; pale yellow soap, 1 oz. Cut the wax and soap into thin slices, and boil them in the rain water until dissolved. Take off the fire, and occasionally stir till cold. Afterward add 90% alcohol, bottle, and it is ready for use. The above compound should be applied with a piece of flannel, and afterward rubbed with a soft cotton cloth.

Useful Furniture Polishes for Family Use.—1. One oz. beeswax, ¼ oz. white wax, 1 oz. Castile soap. The whole to be shredded very fine, and a pint of boiling water poured upon it; when cold, add ½ pt. turpentine and ½ pt. spirits of wine; mix well together. To be rubbed well into the furniture with one cloth and polished with another.

2. Pearlash, 1 oz.; water, 8 oz.; beeswax (genuine), 6 oz. Mix with heat, and add sufficient water to reduce it to the consistency of cream. For use, add more water, and spread it on the wood with a painter's brush. Let it dry, and polish with a hard brush or cloth. If white wax is used, it may be applied to polish plaster casts, statues, etc.

3. Two gal. raw linseed oil, 1½ gal. turpentine, ¼ lb. dragon's blood, ¼ lb. rosin, ¼ lb. alum, 2 oz. iodide potassium, ½ lb. sulphuric acid, 8 oz. nitric acid; using avoirdupois weight for the dragon's blood, rosin, alum, iodide potassium, and sulphuric acid; common wine or liquid measure for the oil and turpentine; apothecaries' measure for the nitric acid. The directions for preparing the polish are as follows: First put the oil and turpentine into an earthen vessel, then pulverize the dragon's blood, rosin, alum and iodide potassium to a fine powder. Stir this powder slowly into the oil and turpentine; then add the sulphuric acid slowly, stirring continually. Let this mixture stand ten hours, then add the nitric acid. Slowly stir the mixture while adding. Apply with a sponge or cloth.

4. Messer, of Berlin, dissolves 6¾ lb. shellac in about 28 pt. alcohol, and then mixes this with another obtained by dissolving 25 drm. gun cotton in 25 drm. high grade sulphuric ether to which is added 12½ drm. camphor and enough 96% alcohol to completely dissolve the mass. This polish is finally rubbed up with pure linseed oil. To 100 parts of it 5 parts of a saturated solution of camphor in oil of rosemary are then added. A very dilute solution of benzole in alcohol is used for polishing off.

5. One gal. soft water, 4 oz. soap, 1 lb. white wax in shavings; boil these together and add 2 oz. pearlash. This is to be diluted with water, laid on the furniture with a paint brush and polished off with a cloth or a hard brush.

6. Dissolve 1½ lb. potash and 1 lb. virgin wax in 1 gal. hot water, and boil the whole for half an hour; then stand to cool. Remove the wax from the surface, put it into a mortar and triturate it with a marble pestle, adding sufficient soft water to form a soft paste. This laid neatly on furniture or even on pictures, and carefully rubbed when dry with a woolen rag, gives a polish of great brilliancy and softness.

7. Household furniture is readily cleaned by washing it with a little warm ale, the polish being brought up subsequently by means of a cloth damped with paraffine oil. The following has been strongly recommended for renovating old furniture and bringing up a good polish: Take olive oil, 1 lb.; rectified oil of amber, 1 lb.; spirits of turpentine, 1 lb.; oil of lavender, 1 oz.; tincture of alkanet root, ½ oz. Saturate a piece of cotton batting with this polish, apply it to the wood, then with soft and dry cotton rags rub well and wipe off dry. Keep the polish in a stoppered bottle.

8. Pure beeswax, 1¼ lb.; linseed oil, ¼ lb. Melt together and remove from the fire, and when the mixture has cooled a little add 1 qt. turpentine and mix well. The way to make it *with soda* would be to dissolve the soda in hot water, add the wax in small pieces and mix well over the fire. The former method is preferable.

9. A high polish on ebony, one that will be durable. Give the work two coats of fine

copal varnish and rub this down, when quite dry smooth with fine pumice, put on a third coat of the same and rub down with rottenstone; clean and put on a flowing coat of best spirit copal varnish, and when this has become quite dry, polish with chamois skin and the palm of the hand.

A Red Polish.—

Oil of turpentine	16	oz.
Alkanet	4	drm.
Beeswax	4	oz.

Digest the alkanet in the oil until sufficiently colored; then scrape the beeswax fine and form a homogeneous mixture by digestion over a water bath.

For a pale polish omit the alkanet.

For Turner's Work.—Dissolve 1 oz. sandarac in ½ pt. 90% alcohol; shave 1 oz. beeswax, and dissolve it in sufficient spirits of turpentine to make it into a paste; add the former mixture to it by degrees; then, with a woolen cloth, apply it to the work while it is in motion in the lathe, and polish it with a soft linen rag; it will appear as if highly varnished.

Satinwood or Maple.—One quarter oz. chrome yellow to 1 gill light French polish; use as before described; a little chrome yellow on the rubber is desirable. In French polishing always use a drop of linseed on the rubber.

For Wainscot.—Take as much beeswax as required, and, placing it in a glazed earthen pan, add as much 90% alcohol as will cover it, and let it dissolve without heat. Add either ingredient as is required, to reduce it to the consistence of butter. When this mixture is well rubbed into the grain of the wood, and cleaned off with clean linen, it gives a good gloss to the work.

Walnut, to Polish.—To give black walnut a fine polish so as to resemble rich old wood, apply a coat of shellac varnish, and then rub it with a piece of smooth pumice stone until dry. Another coat may be given, and the rubbing repeated. After this, a coat of polish, made of linseed oil, beeswax, and turpentine, may be well rubbed in with a dauber, made of a piece of sponge tightly wrapped in a piece of fine flannel several times folded and moistened with the polish. If the work is not fine enough, it may be smoothed with the finest sand paper and the rubbing repeated. In the course of time the walnut becomes very dark and rich in color, and in every way is superior to that which has been varnished.

Wax Polishing.—1. There is no particular art in wax polishing floors, the principal requirements being plenty of elbow grease and a good hard brush. The floor, after being well scrubbed, is allowed to dry. When dry, it is painted over with a large, soft whitewash brush dipped in oak stain. This is allowed to dry for twenty-four hours. The floor is then gone over with thin size, and this is, in turn, allowed to dry for twenty-four hours. After this, the floor is painted over with a kind of varnish made by dissolving beeswax in spirits of turpentine, the proportions being about 1 lb. of wax to 2 qt. of turps. The wax is shredded, placed along with the turps in a stone bottle, and the whole put on the hob and frequently shaken. When this varnish has soaked well in, the whole floor is polished with a rather hard brush until a good surface is obtained. Special brushes, adapted to polishing waxed floors, are sold at paint stores.

2. Wood Finish.—Richness of effect may be gained in decorative woodwork by using woods of different tone, such as amaranth and amboyna, by inlaying and veneering. The Hungarian ash and French walnut afford excellent veneers, especially the burls or gnarls. A few useful notes on the subject are given by a recent American authority. In varnishing, the varnishes used can be toned down to match the wood, or be made to darken it, by the addition of coloring matters. The patented compositions known as wood fillers are made up in different colors for the purpose of preparing the surface of wood previous to the varnishing. They fill up the pores of the wood, rendering the surface hard and smooth. For polishing mahogany, walnut, etc., the following is recommended: Dissolve beeswax by heat in spirits of turpentine until the mixture becomes viscid; then apply by a clean cloth, and rub thoroughly with a flannel or cloth. A common mode of polishing mahogany is by rubbing it first with linseed oil and then by a cloth dipped in very fine brickdust; a good gloss may also be produced by rubbing with linseed oil, and then holding trimmings or shavings of the same material against the work in the lathe. Glasspaper, followed by rubbing, also gives a good luster.

3. For large surfaces it is advisable to get the wax more deeply imbedded in the wood, and when a layer has been rubbed on, a hot iron passed over the surface will melt the wax and drive it in. This gives more body to polish on than by the method first described. The work is afterward treated with more wax on a rubber, and finally polished.

Finish, Waterproof, on Veneering.—The polish to be applied the same as French polish. Use linseed oil, 1½ lb.; amber, 1 lb.; litharge, 5 oz.; white lead, pulverized, 5 oz.; minium, 5 oz. Boil the linseed oil in an untinned copper vessel, and suspend in it the lithage and minium in a small bag, which must not touch the bottom of the vessel. Continue the boiling until the oil has acquired a deep brown color, then take out of the bag and put in a clove of garlic; this is to be repeated 7 or 8 times, the boiling being always continued. Before the amber is added to the oil it is to be mixed with 2 oz. linseed oil and melted over a fire that is well kept up. When the mass is fluid, it is to be boiled and stirred continually for 2 or 3 minutes; afterward filter the mixture, and preserve it in bottles tightly corked. When this varnish is used, the wood must be previously well polished and covered with a thin coat of soot and spirits of turpentine. When the coat is dry, some of the varnish may be applied, which should be equally distributed on every part with a small, fine sponge. This operation must be repeated four times, being always careful that each coat is well dried first. After the last coat of varnish, the wood must be dried in an oven and afterward polished.

A White Polish.—

White wax	1	lb.
Solution of potash	32	oz.

Boil to proper consistency.

White Polish for Light Woods.—White (bleached) shellac, 3 oz.; white gum benzoin, 1 oz.; gum sandarac, ½ oz.; alcohol or wood naphtha, 1 pt.; dissolve.

Polishes, French. See **Polishing, *Wood.***

Pomades, *Pommades, Pomatum.*—France is the land of pomades, and her manufacturers are as celebrated for the variety and excellence of these products as they are for almost all other articles connected with perfumery, the cosmetic arts, and the toilet. This arises from the care, skill, taste, and integrity exercised in their preparation by all the respectable houses there. The superiority of French pommades over the pomatums of the English perfumers and druggists is so generally known and appreciated that, of late years, the latter, in order to force the sale of their scented compounds of coarse, and often rancid, oils and fats, have adopted the practice of affixing spurious French labels to them.

1. The first object of consideration with the French perfumer is to obtain the fatty basis of his pommades from a young and healthy animal, and in as fresh and pure a state as possible. Lard, beef, suet, mutton suet, beef marrow, veal fat, and bear's fat, are those which, in a rendered state, he chiefly employs, either singly

or in mixtures of two or more of them. After selecting his fat, he carefully removes from it extraneous skin, fiber, and moisture, and then pounds it in a cold marble mortar until all the membranes are completely torn asunder. He next places it in a covered pan of porcelain or tinned copper, and submits it to the heat of a water bath until its fatty portion is liquefied, and all albuminous matter, fibers, water, and other foreign substances have completely separated and subsided. Then he carefully skims the liquid fat, and pouring off the clear portion from the sediment, passes it through a clean flannel filter into a deep porcelain or stoneware pot furnished with a lip, or into a basin or other vessel of the like material, of which the bottom and sides are curvilinear and expanding upward. The first is employed when he intends to aromatize or perfume the fat, and pot it at once, as is the case with ordinary pomades; the second, when he desires to submit it to further treatment. In the latter case, the vessel, after being covered to exclude dust and dirt, is set aside in a situation where its contents will cool slowly. The next day the basin or pan is placed, for a few minutes, in warm water to the depth of its contained fat, and is then inverted, so that the mass of fat may fall bottom upward on a sheet of white paper previously placed to receive it in a cool situation free from dust. In this way any water that escaped removal in the first rendering drains off. When the exterior portion of the mass has become cold, the operator removes adhering moisture (if any) by dabbing it with a soft spongy cloth, and any particles of dirt, fiber, etc., that passed the flannel filter, by means of a bone palette knife. He next chops up the fat, and again liquefies it, in a suitable vessel, by the heat of hot water. Lastly, he either adds the necessary matter to prevent the accession of rancidity, with the aromatics or perfume, and at once finishes off and pots the pommade, or he covers the vessel, and sets it aside in a cool place, to preserve its contents as stock fat for future use.

2. In adding his aromatics or perfumes to the melted fat, the operator, as a rule, adapts its temperature to their relative degree of volatility. Essential oils and alcoholic essences, particularly the more delicate ones, he adds at the lowest possible temperature compatible with their perfect union with the fat; while substances, like the aromatic resins and balsams, he adds to the fat more fully liquefied by heat, and aids their solution and union by stirring the mass with a wooden, bone, or porcelain knife or spatula. With the latter, after the union is complete, it is often necessary to allow the mixture to repose for a short time, and to pour it off from the dregs before adding the essential oils and essences, and concluding the work.

3. In finishing off pommades, two methods are adopted, according to the appearance it is desired they should have. Those which it is intended should be opaque and white, the operator stirs or beats assiduously with the knife or spatula until the fat begins to concrete, or has acquired considerable consistence before potting it; but when it is desired that they should be transparent or crystalline, the clear liquid mass is poured into the pots or bottles, previously slightly warmed, and the whole is allowed to cool very slowly, without being disturbed, in a situation free from draughts or cold air.

4. For the ordinary pommades a mixture of lard and suet is generally employed; for the harder ones, suet chiefly or wholly; or a little pure white wax or beeswax (according to the intended color of the product) is melted with the fat, to increase its solidity.

5. For white pommades, mutton suet is employed; for others, in general, beef suet. In those which are artificially colored, either may be used; but beef suet is preferable when either clearness or a crystalline appearance is desired.

6. The colored pommades derive their respective hues from tinctorial substances dissolved or steeped in the melted fat before scenting it, the process being similar to that adopted for the colored oils.

7. Green is given by powdered gum guaiacum, or the green leaves or tops of parsley, spinach, lavender or walnut.

8. Red, by alkanet root; or by carmine added with the perfumes.

9. Orange, by annatto, or by annatto and palm oil mixed.

10. Yellow, chiefly by palm oil. The suet and other fat of Guernsey oxen and cows possesses a rich pale yellow, sufficiently deep for many pommades without artificial coloring.

The French perfumers commonly divide their pommades, like their oils, into four classes, according to the methods which they employ to scent them:

11. Pommades prepared by the addition of the essential oils, fragrant essences, and perfumed *huiles*, to the simple pommade liquefied by a gentle heat; or by dissolving the fragrant resins and balsams in it; each in the manner previously explained. In this way are prepared the pommades of ambergris, bergamot, cassia (ordinary), cedrat, cinnamon (ordinary), cloves, lavender, lemon, lemon thyme, limettes, maréchale, marjoram, millefleur, musk, neroli, nutmeg, orange flower (ordinary), orange, portugal, rondeletia, rose, rosemary, thyme, verbena, and between 40 and 50 other pommades kept by the Parisian perfumers, and all, or nearly all, those of the perfumers and druggists in this country.

12. Pommades by Infusion.—These are prepared by digesting the odorous substances in the simple pommade, at a very gentle heat, for two or three, to eight or ten hours, according to their nature, in the way already noticed under "Oils;" observing to stir the mixture frequently, and to keep the vessel covered as much as possible during the whole time. One part of flowers, carefully picked and pulled to pieces, to 3 or 4 parts of pommade, are the usual proportions. The next day the mixture is again gently heated, and, after being stirred for a short time, is thrown into a strong canvas bag, which is then securely tied, and at once submitted to the action of a powerful press. The whole operation is then repeated several times with fresh flowers, or other bulky odorous substance, *until* the pommade be sufficiently fragrant. This will require 3 to 6 times its weight in flowers. Lastly, in the case of flowers, the pommade is liquefied in a covered vessel, at a gentle heat, as before; and after sufficient repose to allow it to deposit adhering moisture, is poured off for stock, or is at once potted. The mode of proceeding with the aromatic barks, seeds, resins, balsams, etc., the duration of the infusion, and the proportions taken, are, for the most part, similar to those of the corresponding huiles or oils; but here the first two substances, and others of a like nature, are only bruised, ground, or sliced very small, and not reduced to actual powder, before digestion, as pommades, unlike oils, cannot be freed from fine powder or dust by filtration through fine media or by repose in the cold.

13. In this way are prepared the *pommades* of balsam of Peru, benzoin, cassia, cinnamon, lavender (green), orange blossoms, orris root (violet), roses (colored), stryax, vanilla, and several others kept by the Continental perfumers, and known and spoken of in this country by their French names, as *Pommade aux fleurs d'oranges, à la rose, à la fanille*, etc.

14. Pommades by the Flowers or Enfleurage.—These are prepared by a similar process to that adopted for the corresponding huiles. On the large scale a layer of simple pommade is spread with a bone palette knife on panes of glass, to about the thickness of a finger, and the sur-

face is closely stuck all over with the newly gathered flowers. The panes are then placed in shallow frames of wood and these are closely piled one upon another in stacks, in a moderately cool situation. In some of the great perfumeries of France many thousands of these frames are employed at once. On the small scale, porcelain or pewter plates are generally used instead of panes of glass, and are inverted over each other in pairs, so as to fit close at the edges. In each case the flowers are renewed daily and the fat stirred up and respread occasionally, for one, two, or even three months, or until the pommade has become sufficiently fragrant to render it of the quality intended by the manufacturer. It is now scraped off the panes or plates into the store pots and is ready for use or sale.

In this way are prepared the finest qualities of cowslip pommade, honeysuckle pommade, jasmine pommade, jonquille pommade, etc.

Bear's Grease.—The fat of the bear has long been highly esteemed for promoting the growth of human hair, but without sufficient reason, since experience shows that it possesses no superiority over the fats ordinarily employed by the perfumers. Indeed, if we may regard the somewhat rank smell of genuine bear's grease as an indication of its quality, it must be inferior to them as a hair cosmetic; besides which, it is much more costly. The greater portion of the so-called bear's grease is prepared by one or other of the following formulæ:

Bear's Grease (Factitious).—1. Take of—

Washed hog's lard (dry)	1¼ lb.

Melt it by the heat of a water bath; add of—

Balsam of Peru	2	drm.
Flowers of benzoin	1	drm.
Palm oil (bright)	1	drm.

Stir vigorously for a few minutes, to promote solution. Then remove the pan from the bath, and after repose for a short time, pour off the clear portion from the sediment, and stir the liquid mass until it begins to cool.

2.—Take of—

Soft veal fat	1	lb.
Palm oil	½	drm.

Melt, and when nearly cold, stir in of—

Nitric ether (genuine)	2	fl. drm
Essence of ambergris	7 or 8	drops.

3.—Take of—

Hog's lard	1	lb.
Veal suet	1	lb.
Olive oil	3	oz.

Melt, cool a little, and stir in of—

Compound tincture of benzoin	1	fl. oz.

Pommade, for Inflammation of the Skin.—Pure lard, 4 lb.; calf suet, 1 lb.; juice of cucumbers, 3 lb. Melt the lard and suet, mix in the cucumber juice and macerate for some time. After infusing for a day or two, decant and add as much of fresh juice. Repeat this operation ten times always with new juice. When the fat has acquired a perceptible odor of cucumbers, melt over a water bath, and add to every pound 3 lb. of starch. Stir well and put up in jars.

Cacao Pomade.—Equal parts cacao butter, oil of almonds, pure white wax. Melt over a water bath and stir until nearly cold. Used as an emollient, for chapped hands, lips, etc. It may be colored with a little palm oil, and may be scented if desired.

Pommade de Casse, Cassia Pomatum.—Take of

Plain pommade	1	lb.
Annatto (finest)		½ drm. (or q. s.)

Melt them together, and stir for some time. After repose, pour off the clear portion, add of

Oil of cassia (finest)	1½	drm.
Huile au jasmine	1½	drm.
Neroli	½	drm.
Oil of verbena or lemon grass	20	drops.
Otto of roses	8 or 10	drops each.
Essence royale		

Stir the mixture until it begins to cool. Delightfully fragrant. The common practice is to substitute 3 to 4 drm. of bright palm oil for the annatto; but the color of the product is then not so rich.

Castor Oil Pomade.—Mix the following:

Castor oil	4	oz.
Prep. lard	2	oz.
White wax	6	drm.
Oil bergamot	½	drm.
Oil lemon	½	drm.

Castor Oil Pomatum.—Tuberose pomatum, 1 lb.; castor oil, ½ lb.; almond oil, ½ lb.; otto of bergamot, 1 oz.

Cazenave's Pomimade.—Take of—

Beef marrow (prepared)	4	oz.
Tincture of cantharides (Paris Codex)	½	fl. oz.
Cinnamon (coarsely powdered)	½	oz.

Melt them together, by the heat of a water bath; stir until the spirit in the tincture has evaporated, decant the clear portion, and again stir until the mass concretes. It is cheaper and more convenient to omit the powdered cinnamon, and to strongly scent it with oil of cinnamon (or of cassia) after the removal of the vessel from the bath.

Chafe Pomade.—Nothing is more troublesome to fat men and women (and to many who are not fat) than chafing under the arms, between the legs and elsewhere, to which they are subject especially in hot weather. The following will relieve it like magic:

Lanolin	85 parts.
Albolin	10 parts.
Campho-phenique	5 parts.

The directions for use on the label should instruct the purchaser to wash the affected parts with suds made of tepid water and white Castile soap; to dry them softly with a very soft napkin or old towel, without rubbing; and then to apply the pomade. This should be done on retiring and on getting up in the morning.—*Pharm. Era.*

The following partake more of the nature of fixateur and cement than of the preparations before noticed:

Pommade Collante.—1. Take of—

Oil of almonds	3	oz.
White wax	1	oz.

Melt, and before it cools, stir in, of—

Tincture of mastic (strongest)	1	fl. oz.
Oil of bergamot	20 to 30	drops.

Used, like bandoline, to stiffen the hair, and to keep it in its place.

Cosmos Pomade.—White wax, 1½ parts; spermaceti, 3 parts; 2 parts castor oil; 8 parts almond oil; glycerine, 2 parts; 9 parts extract mignonette; ½ part Cologne water.—*Hagar.*

Cowslip Pommade or Pomatum.—

Plain pommade	1 lb

Liquefy it at a very gentle heat, and stir in—

Oil of bergamot	1½	fl. drm.
Oil of lemon	½	fl. drm.
Oil of orange peel	½	fl. drm.
Huile au jasmin	15 to 20	dps. each.
Essence de petit grain		
Essence of ambergris	5 or 6	dps. each.

Crystallized Pommade or Pomatum.—

Oil of almonds or olives	1	pt.
Spermaceti (best, pure)	¼	lb.

Melt them together by a gentle heat, add scent, at will, and while sufficiently warm to

be clear, pour it into warm glass bottles, and allow it to cool very slowly, and without disturbance. Some persons add 1 drm. of camphor. It is usually preferred uncolored. If tinged at all, it must be only very faintly so, and with substances that will not cause opacity.

Pomade of Cucumber.—Benzoinated lard, 6 lb.; spermaceti, 2 lb.; spirit of cucumber, 1 lb. Melt the spermaceti with the lard, then keep it constantly in motion while it cools. Beat the grease in a mortar, gradually adding the essence of cucumber, continue to beat the whole until the spirit is evaporated, and the pomade is beautifully white. Apply by rubbing a little over the skin at bed time.

Pommade Divine.—

1. Refined beef marrow	1	lb.
Cypress wood (rasped)	1	oz.
Orris root (in coarse powder)	1	oz.
Liquid styrax	1	oz.
Cinnamon (powdered, but not dusty)	½	oz.
Cloves (well bruised)	¼	oz.
Nutmegs (well bruised or grated,	¼	oz.

Digest, by the heat of a water bath, in a covered vessel, for five or six hours, and then strain through flannel. Very fine, and much esteemed for the hair, and also as an occasional skin cosmetic.

2. Plain pommade (or soft beef fat)	1	lb.

Melt by a very gentle heat, and stir in—

Essence of violets	2	fl.drm.
Huile au jasmine	1½	fl.drm.
Oil of begamot	1	fl.drm.
Oil of lemon	1	fl.drm.
Oil of lavender	½	fl.drm.
Oil of origanum	½	fl.drm.
Neroli, Oil of casssia, Oil of cloves, Oil of verbena	6 or 8	drops of each.

Delightfully and powerfully fragrant, but apparently unnecessarily complicated. The product of the first is, however, the genuine pommade divine. In second and ordinary qualities, double the above proportion of fat is usually employed.

Ebony Pomatum.—White wax, 4 oz.; any pomade, 12 oz.; melt, add levigated ivory black, 2 oz.

Pommade Noire en Bâtons (for the eyebrows and mustache).—Prepare this pomade in the usual way, using a third of wax instead of a fourth, in winter, and the half in summer. When it is cool enough, mould it in forms, envelop in tin foil, and label for market.

Hair Pommades.—

1. Plain pomade (or fat)	1	lb.

Melt it at the lowest degree of heat that will effect the object, add of—

Oil of bergamot	1	drm.
Oil of lemon	1	drm.

Stir the mixture until it begins to concrete, and then pour it into the pots or bottles. This forms the ordinary pomatum or pommade of the shops.

2. Plain pommade	1	lb.
Oil of bergamot	1	drm.
Oil of lemon	¾	drm.
Oil of cassia	½	drm.
Oil of cloves or nutmeg	20	drops.

As before. More fragrant and agreeable than the first.

3. Plain pommade	1	lb.
Oil of bergamot	1	drm.
Huile au jasmine	½	drm.
Neroli	½	drm.
Oil of verbena	20	drops.
Oil of cassia	10	drops.

As before. Very fragrant and delicate.

4. Plain pommade	1	lb.

Melt, as before, add of—

Balsam of Peru (or liquid styrax)	2	drm.

Stir until dissolved, and then add of—

Oil of cassia	20	drops.
Oil of cloves	15	drops.
Essence of ambergris	12	drops.

5. Plain pommade	1	lb.
Oil of cassia	1	drm.
Oil of cloves	½	drm.
Essence of ambergris	20	drops.
Oil of rhodium	15	drops.
Essence of musk	15	drops.

As before. Possesses a very agreeable and durable odor.

6. Plain pommade	1	lb.
Otto of roses	½	drm.
Oil of rhodium	15	drops.
Neroli	15	drops.
Essence royale	12	drops.

As before. Much esteemed by those who appreciate the fragrance of roses.

7. Lassar's Hair Pomade.—		
Pilocarpine	2	parts.
Quinine hydrochlorate	4	parts.
Sulphur, precipitated	10	parts.
Balsam of Peru	20	parts.
Ox marrow, to make	100	parts.

Hard Pomatum, Roll Pomatum, Stick Pomatum.—1.

Prepared beef suet (hard)	1	lb.
Beeswax (pure, bright)	2½	oz.
Gum benzoin (in coarse powder)	1	drm.

Melt them together, at a gentle heat, stir well, and, after a little repose, pour off the clear portion. To the latter, when it has cooled a little, add of—

Oil of lavender	1	fl.drm.
Oil of cassia	15	drops.
Essence of ambergris	15	drops.

Just before the mass concretes, pour it into moulds of paper or tin foil, and when these have become quite cold and hard, cover them with ornamental wrappers. Very fine. Has a slight yellowish color.

Pommade d'Hebe.—

White wax (pure)	2	oz.

Melt, add of—

Juice of lily bulbs	4	oz.
Narbonne honey	4	oz.
Eau de rose	½	oz.
Esprit de rose	½	fl. drm

Stir until it solidifies. Applied night and morning to remove wrinkles, freckles, etc.

Marrow Pomatum.—Purified lard, 4 lb.; purified suet, 2 lb.; otto of lemon, 1 oz.; otto of bergamot, ½ oz.; otto of cloves, 3 drm. Melt the greases; then beat up with a whisk or flat wooden spatula half an hour or more.

Peruvian Pommade.—

Lard (good, washed)	½	oz.
Beef suet (clarified)	½	oz.
Balsam of Peru	½	oz.

Mix, as before, add of—

Oil of nutmeg	½	fl. drm

and pour it into pots or dumpy wide mouthed phials. Dr. Copland adds a little oil of lavender. In high repute as a hair restorer.

Plain Pomatum or Pommade, Pommade Simple.—

1. Hog's lard (carefully rendered)	2	parts.
Beef suet (carefully rendered)	1	part.

Melt them together by a very gentle heat. The product is of the proper consistence for temperate climates.

2. Lard	5	parts.
Mutten suet	2	parts.

For white pommades, as the last.

3. Lard ..... 1 part.
Suet ..... 1 part.

For warm climates. For tropical climates even more suet may be used, and ½ to 1 oz. of pure wax, per pound, may be added.

In pommades containing bear's fat, marrow, oil, etc., or wax or spermaceti, the proportions of the other ingredients are so adjusted that the product may be of the proper consistence. This chiefly occurs in hair cosmetics.

Quinine Pommades.—Antonini.—

Disulphate of quinine	1	drm.
Alcohol	2	fl. drm
Sulphuric acid	10	drops.

Dissolve, and triturate the solution with—

Lard (pure, hard)	3	oz.

Both are used to promote the growth of hair in laxness of the scalp, the former being the more active and scientific preparation. They are said to be also serviceable in nervous headache of an intermittent kind.

Soubeiran's Pommade.—

Oil of almonds	½	oz.
Disulphate of quinine	1	drm.

Triturate them together in a warm Wedgwood ware mortar until thoroughly united; then add of—

Prepared beef marrow	1½	oz.

and continue the trituration until the mass is cold. Scent may be added. Recommended for strengthening and restoring the hair.

Pommade en Bâtons (Stick Pomatum).—The stick pomatum is generally composed of mutton suet, but it is also made of the hard body, to the pound of which, in summer time, must be added 1 oz. of wax. The lard body can also be used, but then the proportion of wax should be increased, for it is requisite that the pomade in stick should be of firm consistence. Always melt the least fusible body first.

Strawberry Pomade.—

Fresh strawberries	4	oz.
Cocoanut oil	18	oz.
Almond oil	9	oz.
White wax	3	oz.

Melt the last three ingredients on a water-bath and digest the strawberries in the mixture for at least an hour, at a heat which just keeps the mixture melted. Then heat to 100° C. to drive off moisture; add a sufficiency of alkanin to color (or the almond oil may be colored with alkanet root); strain, and perfume with 10 drops of otto of rose.

Pomade de Tobolksa.—Melt ½ lb. purified beef suet and ½ lb. purified lard; 1 lb. mutton suet; 2 lb. purified bear's grease. Add to this 6 oz. fine white salt, and stir constantly while cooling, so as to incorporate it thoroughly. Perfume with 6 oz. parsley seed, 1 oz. anise seed, and 1 oz. fennel seed, all finely powdered, and when the whole is thoroughly mixed, put in 2 oz. anise.

Tonquin Pomade and Tonquin Oil are prepared by macerating the ground Tonquin beans in either melted fat or warm oil from 12 to 28 hours, in the proportion of Tonquin beans ½ lb., fat or oil 4 lb. Strain through fine muslin; when cold the grease will have a fine odor of the beans.

Transparent Pomade.—The following is a French recipe:

Spermaceti	2	oz.
Castor oil	5	oz.
Alcohol	5	oz.
Oil of bergamot	½	drm.
Oil of Portugal	½	drm.

Melt together the spermaceti and castor oil, pour in the alcohol gradually, stop the heat and add the perfume. Stir well and pour into glass jars.

Vanilla Pomatum, Pommade à la Vanille, Pommade Romaine.—

1. Plain pommade ..... 1½ lb.
Vanilla (in coarse powder) .... 1 to 1¼ oz.
Cassia (in coarse powder) ..... 1½ drm.
Cloves (in coarse powder) ..... 1½ drm.

Proceed by infusion for two hours. To the clear decanted portion add—

Huile à la rose	2½	oz.
Oil of bergamot	1	fl. drm
Otto of roses	12	drops.

and let it cool slowly and undisturbed after it begins to thicken. Very fine.

2. Plain pommade ..... 1 lb.

Melt, and add—

Essence of vanilla (finest)	4 or 5	fl. drm
Otto of roses	8 or 10	drops.

As before. Very fine. The plain pommade may be previously slightly tinged with annatto.

Pommade Scents.—1. Cowslip.

Oil of bergamot	2	oz.
Oil of lemon	1	oz.
Essential oil of jasmine	¼	oz.
Essence de petit grain	¼	oz
Oil of rose geranium	1½	drm.
Oil of cloves	1	drm.
Oil of rhodium	½	drm.

Mix by agitation.

2. Jonquille.—

Oil of bergamot	2	oz.
Oil of lemon	2	oz.
Oil of orange peel	5	drm.
Oil of cloves	3	drm.
Oil of sassafras	2	drm.
Liquid storax	1	drm.

Put them into a bottle, cork it close, digest in the sun, or a very gentle heat, with agitation for two hours, and, after repose for a week, decant the clear portion.

3. Maréchale.—

Oil of bergamot	1	oz.
Oil of cloves	1	oz.
Oil of lavender (English)	1	oz.
Essence of ambergris	1½	fl. drm
Essence of musk	1½	fl. drm
Oil of orris root	½	drm.
Oil of origanum	½	drm.
Oil of sassafras	½	drm.

Agitate them well together, and again each time before use.

4. Millefleur.—

Essence of ambergris (royale, finest)	1	fl. oz.
Oil of lemon	¾	oz.
Oil of cloves	½	oz.
Oil of lavender (English)	½	oz.
Oil of bergamot	3	drm.
Essence de petit grain	2	drm.
Balsam of Peru	2	drm.
Oil of cassia	2	drm.

Mix and proceed as before. Or, instead of the balsam of Peru, 1 drm. oil of bitter almonds may be added.

Vanilla Oil and Pomade.—Vanilla pods, ¼ lb.; fat or oil, 4 lb. Macerate at a temperature of 25° C. for three or four days, finally strain.

Common Violet Pomatum.—Purified lard, 1 lb.; washed acacia pomatum, 6 oz.; washed rose pomatum, 4 oz.

White, Hard or Stick Pomatum.—Benzoinated suet, 1 lb.; white wax or paraffine, 1 lb.; jasmine pomatum, ½ lb.; tuberose pomatum, ½ lb.; otto of rose, 1 drm.

Pommade Collante (for wigs and false curls).—Take 1½ lb. of best Burgundy pitch, 8 oz. virgin wax, melt them together in a stoneware vessel, and add 1 oz. of liquid pomade. Remove from the bath, and, while yet liquid and warm, stir in 7 fl. oz. of alcohol; when the spirit has been well incorporated, replace the vessel upon the

sand bath, and heat up to a slight boiling; then strain through a linen cloth, perfume with 2 oz. essence bergamot, and, when cold enough, run into moulds.

To move readily from the moulds, turn them before the fire, and the contents soon detach and fall out. While handling these sticks, the hands should be powdered. They are generally from 1 to 3 oz. weight.

Pop.—Five lb. of cream of tartar; ginger, 8 oz.; sugar, 5 lb.; essence of lemon, 5 drm.; water, 30 gal.; yeast, 2 qt

Ginger Pop.—Take 5½ gal. water; ginger root (oruised), ¾ lb.; tartaric acid, ½ oz.; white sugar, 2¼ lb.; whites of 3 eggs, well beaten; 1 small teaspoonful lemon oil; 1 gill yeast. Boil the root for 30 minutes in 1 gal. water; strain and put the oil in while hot; mix. Make overnight; in the morning skim and bottle.

Ginger Pop.—Five lb. of loaf sugar to 5 gal. of cold water, 4 lemons, 2 oz. white root ginger, 4 oz. cream tartar. Boil the sugar and ginger (previously pound the latter); when it has boiled fifteen minutes strain it through a flannel cloth into a large crock, put in the cream tartar, slice also the lemon into it; let it stand until milk warm, then add a teacup of yeast; let it stand a little, then bottle it tightly in stone bottles; in three days it will be fit for use.

Pop, Imperial.—Cream of tartar, 3 oz.; ginger, 1 oz.; white sugar, 24 oz.; lemon juice, 1 oz.; boiling water, 1½ gal. When cool, strain and ferment with 1 oz. yeast. Bottle.

Royal Pop.—To 3 gal. of water add ½ lb. cream tartar, ¾ oz. ginger, 3½ lb. white sugar, ½ drm. essence of lemon, ½ pt. yeast. The corks should be tied down.

Porcelain, Cement for. See **Cements.**

Porcelain, to Cut.—Place on a mandrel in a lathe a thin disk of copper or iron 3 in. in diameter. Supply it with rather fine emery and oil, and while revolving it at a speed of 400 or 500 revolutions per minute, hold the vase against the periphery of the disk. The disk should be often supplied with emery and oil.

Porcelain Enamel for Iron. See **Enameling.**

Porcelain, Glazes for. See **Glazes.**

Porcelain-Lined Kettles.—Grind together 100 parts of powdered calcined flints (or white quartz sand, free from iron), 50 parts of calcined borax (borax glass), and 20 parts of kaolin (white potter's clay), pass the mixture through an 80 mesh sieve, and mix it with water to form a thin paste. Line the vessel with this and let it dry slowly. Then fuse together 125 parts of white glass, 250 parts of borax, and 20 parts of soda; powder when cold, and make into a thin paste with 4 parts of soda and a sufficient quantity of hot water. Cover the first coating with this, and after thoroughly drying, heat in a muffle until the glazing is properly fused. See **Enameling.**

Porcelain Painting.—Though materials for this purpose can be made, the results will be more satisfactory if the specially prepared paints are used, as experiments are expensive. The Lacroix colors are recommended by Jannier, in his *Practical Keramics.*

Porphyrization.—The reduction of substances in a porphyry mortar. Name also applied to the process of reducing to very fine powder by means of a flat slab and muller.

Port. See **Wines.**

Porter.—A fermented liquor, brewed from pale malt, mixed with a sufficient portion of high dried malt to impart the necessary color and flavor. In many cases its color is imparted by parched malt or burnt sugar, subsequently to the boiling. Porter originated with a London brewer named Harwood, in 1722, and was first called entire, or entire butt, from being drawn from one cask.

Port Fires. See **Pyrotechny.**

Portland Cement. See **Cements.**

Portugal Water. See **Waters.**

Posological Table for proportioning the doses of medicines to the age of the patient, originally drawn up by Gaubius.

Under	½ year	.....	1/12 of a full dose.
"	1 "	.....	1/12 "
"	2 years	.....	1/8 "
"	3 "	.....	¼ "
"	4 "	.....	⅓ "
"	7 "	.....	½ "
"	14 "	.....	⅔ "
"	20 "	.....	⅞ "
Above	21 "	.....	the full dose.
"	63 "	.....	1⅛ of a full dose.
"	77 "	.....	4/3 "
"	100 "	.....	2⅛ "

Dr. Young gives the following simple formula: For children under twelve years, the doses of most medicines must be diminished in the proportion of the age to the age increased by twelve years. Thus, at two years, the dose will be one-seventh of that for an adult,

viz.: $\frac{2}{2+12} = \frac{1}{7}$

Potash Water, Liquor of Potassa, Solution of Potassa, Caustic Potash Water, Potash Soap Lye (pure), Soft Soap Lye, etc.

Carbonate of potash (salt of tartar)..... 1 lb.

Put it into a green glass or stoneware carboy or jar, and add (cautiously) of—

Water, boiling..... 1 gal.

To the resulting solution further add of—

Fresh slaked lime, dry..... ¾ lb.

Next put in the stopper or bung, and shake the vessel very frequently until the whole has become cold. After repose decant the clear supernatant portion into clean green glass well stoppered bottles.

Potatoes, to Preserve.—For preserving potatoes in store, the floor is sprinkled with fine quicklime; this is covered with a layer (4 to 5 in. thick) of potatoes; this by a sprinkling of quicklime again, and so on, using the lime in the proportion of about 1 measure to 40 measures of potatoes. This method checks disease when it is present, and improves the potatoes if they are watery or waxy. Layers of straw and powdered plaster of Paris may be substituted for the lime.

Potin. See **Alloys.**

Pot Metal. See **Alloys.**

Pot Pourri.—1. Spread thinly the fresh collected flowers on porous paper placed in shallow trays, and expose them to the sun or warm air until sufficiently dry, then lightly crumple them up small between the hands, and, the other dry odorous ingredients being added, with or without a little essential oil of the same kind as the dried flowers, thoroughly mix the whole together. Sometimes essential oils only are added to the dry flowers, but the fragrance of the product is then much less durable. As the basis of his finest dry pot pourri, the Continental perfumer usually substitutes either reindeer moss or ragged hoary evernia, in very coarse powder, for the dried flowers.

2. A mixture of odorous flowers, roots, gums, etc., varied according to the taste of the operator, either mixed together dry or in the fresh state preserved with salt. The following is a French formula: Take the petals of the pale and red roses, pinks, violets, orange flower, lilies of the valley, mignonette, heliotrope, jonquils, with a small proportion of the flowers of myrtle, balm, rosemary, and thyme; spread them out for some days, and as they become dry, put them into a jar, with alternate layers of dry salt, mixed with orris powder, till the

vessel is filled. Close it for a month, stir the whole up and moisten with rose water.

3. Pot-pourri is a mixture of dried petals of roses, violets, etc., mixed with 1-10 its weight of salt. The leaves of fresh roses, etc., are collected and dried on porous paper in the sun; as soon as dry they are placed in a jar in layers alternating with the salt. Powdered orris root and extracts and many other ingredients may be added according to taste.

4. This is a mixture of dried flowers and spices not ground. Dried lavender, 1 lb.; whole rose leaves, 1 lb.; crushed orris (coarse), ½ lb.; broken cloves, cinnamon, allspice, each 2 oz.; table salt, 1 lb.

5. Lavender flowers, 1 lb.; rose leaves, 1 lb.; cloves, ¼ lb.; cinnamon, ¼ lb.; benzoin, ¼ lb.; pimento, ¼ lb.; common salt, 2½ lb.; oil of lavender, 60 minims; oil santal, 60 minims; oil of geranium, 60 minims; oil bergamot, 120 minims; oil lemon, 60 minims; vanilla, 3 oz.; musk pods, 1 oz.; essence ambergris, ½ oz. Solids all ground.

6. Pot-pourri (for mixing with rose leaves).—Tonka bean, ½ part; cinnamon, pimento, 1 oz. of each; coriander, 4 oz.; benzoin, 5 oz.; orris root, 1 lb. Reduce to powder, mix, add ½ oz. essence bouquet toward end.

Pottery, to Convert into Antique.—The way to convert modern pottery into the antique is to boil the former in oil and bury it in wood ashes. One will be astonished to find how quickly the new article will become in appearance a veritable antique.

Pottery, to Stain. See **Staining**.

Poultices.—*Bran Poultice.*—Make it like porridge, and put it into a bag. Be sure not to make it so soft as that any water will trickle down to annoy the patient.

Bread and Milk Poultice.—Stale bread, cold milk. Boil bread with enough milk to make a thick pulp; spread it on a piece of soft cotton and apply it very hot. This poultice is often applied without a cloth between it and the affected part, but poultices put into a bag are cleaner and easier rewarmed. Bread poultices are cleansing and soothing.

Fomentation of Camomile Flowers.—Two oz. camomile flowers.

Put into a jar with 2 teacupfuls of water, cover jar very close, let it come to the boil, and infuse for fifteen minutes, keeping lid close on jar all the time; strain off the hot liquor, keep it hot, dip pieces of flannel into it, and apply externally to the part affected. Good to allay swelling and inflammation.

Linseed Meal Poultices.—Linseed meal, boiling water.

Put sufficient meal to make the poultice the size required into a hot bowl, and pour on boiling water enough to make a soft paste; beat quickly for three minutes, or till it looks oily. Have ready a flannel or cotton bag, the size required; pour in the paste, sew up the mouth of the bag quickly. Apply the poultice to the affected part as hot as can be borne.

If ordered with mustard, mix a tablespoonful of dry mustard with the meal. Good for inflammation.

Mustard Poultices.—Dry mustard, cold water.

Mix enough cold water with the mustard to make it into a thick paste; when quite smooth, spread it upon a piece of thin old linen, or cotton; sew it round so as to form a bag. Be careful not to make the poultice larger than required; hold it to the fire for a few minutes, so as not to chill your patient; time, from fifteen to thirty minutes; have ready a piece of clean soft cotton, or a piece of clean wadding, and when you take off the mustard poultice, put on the wadding or the cotton.

Vinegar Poultice.—Crumb of bread soaked in a little cold vinegar and then beaten with a piece of wood to a smooth paste. A popular application in bruises, extravasations, etc., especially black eyes, also in sprains. Verjuice is often substituted for vinegar in the rural districts.

Poultry.—*Poultry Food to Make Hens Lay during Winter.*—

Powdered eggshell or phosphate of lime	4	oz.
Sulphate of iron	4	oz.
Powdered capsicum	4	oz.
Powdered fenugreek	2	oz.
Powdered black pepper	1	oz.
Silver sand	2	oz.
Powdered lentils or powdered dog biscuit	6	oz.

A tablespoonful to be mixed with sufficient meal or porridge to feed 20 hens.

Lice in Poultry.—Make the roosts perfectly clean with hot soap and water, and afterward apply spirits of turpentine or kerosene oil. Also strew some sprigs and branches over the floor of the coop. The building should be kept clean.

Pounce.—Powdered gum sandarac generally passes by this name. Powdered cuttle fish bone is also used. It is used to prepare parchment for writing. The colored powders are used in stamping.

Pouncing Designs.—Prick the outline through the paper, and after placing over the sheet to be marked, dust the back with a bag containing powdered charcoal.

Powders.—*Baking Powders.*—

1. Tartaric acid powder	8	oz.
Bicarbonate soda	9	oz.
Rice flour	10	oz.
A teaspoonful to every 1 lb. flour.		
2. Bicarbonate soda	1	lb.
Farina	1	lb.
Powdered alum	¾	lb.
Carbonate magnesia	½	oz.

Dry in oven separately. Magnesia may be put on the flour. Tartaric acid may replace the alum.

3. Bicarbonate soda	16	oz.
Tartaric acid	14	oz.
Carbonate magnesia	6	oz.
Farina	12	oz.
Rub through a sieve.		
4. Bicarbonate soda	16	oz.
Dry tartaric acid	8	oz.
Rice flour	12	oz.
5. Dry carbonate soda	8	oz.
Dry tartaric acid	6	oz.
Carbonate magnesia	2	oz.
Turmeric powder	1	oz.

The soda and acid are properly dried before mixing, or the powder spoils by keeping. Preserve in stoppered bottles.

6. Bicarbonate of soda	4	oz.
Tartaric acid	3	oz.
Farina	16	oz.

Mix together. By farina is meant any cheap farinaceous material — wheat, rice, or sago flours, etc. To make the packets requires a piece of wood, say 6 in. long for small packets, and the exact size in thickness and width that the packet is to be. The end of this piece should fit into a block of wood and go through it. Take the paper and fold it on the end of the stick, and close it at the end so as to make a square bag; now put the stick with the paper on it into the block, and withdraw the stick, leaving the paper in the block. It is more convenient to measure the powder than to weigh it. Put the powder in a small tin plate funnel, and shake it into the paper; remove the funnel, and fold down the other end of the paper, flatten the folds with the end of the square stick and push the packet out of the block. The whole operation of making the packet should take a very short time.

7. Tartaric acid	½	lb.
Bicarbonate of soda	12	oz.
Starch	12	oz.

Dry each thoroughly previous to admixture, which is effected by passing through a fine sieve repeatedly; pack the powder down tightly, to prevent the absorption of moisture.

8. Goodall's is a compound of—

Rice flour	2 parts.
A mixture of tartaric acid and bicarbonate of soda (each)	1 part.

9. Horsford's Baking Powder.—One powder contains acid phosphate of lime and magnesia mixed with a certain quantity of flour; the other is bicarbonate of soda.

10. Mix together perfectly dry 83 parts by weight of bicarbonate of soda and 188 parts of acid tartrate of potash (cream of tartar).

11. Green's.—Tartaric acid, 35 lb.; sesquicarbonate of soda, 56 lb.; potato flour, 1 cwt. Mix as before.

12. Delforte's.—Powdered tartaric acid, ¼ lb.; powdered alum, ½ lb.; bicarbonate of soda, ¾ lb.; farina, 1 lb. Dry separately by a gentle heat, mix and further add of sesquicarbonate of ammonia (in powder), 3 oz.; lastly, closely pack it in tinfoil.

13. Bicarbonate of soda, 4 oz.; cream of tartar, 9 oz.; fine starch, 7 oz. Dry separately and mix thoroughly. It must be kept from moisture.

Boot Powder.—Poudre steatite de Florence.—1. For drawing on boots. The steatite (soapstone) is a variety of talc, white, gray or green, and sometimes, but rarely, red and yellow, of specific gravity varying from 2·60 to 2·66. It is a very soft stone and can be colored of many shades with substances soluble in oils, acids, alkalies and alcohol.

It is used naturally or colored, according to choice. The unctious property of this substance renders it particularly applicable in facilitating the entrance of the foot into the boot. It suffices merely to sprinkle the powder in the interior of the boot.

2. French chalk reduced to powder by scraping or grating. Used to facilitate the putting on of new or tight boots, a little of it being rubbed on the inside of the backs, heels and insteps.

3. Boot Tops, Pink Powders for.—Oxalic acid, alum, 1 oz. each; cream of tartar and isinglass, ½ oz. of each. Color with cochineal or annatto. Boil the whole in 1 qt. of water for ten minutes.

Bronze Powder. See **Bronzing.**

Cosmetic Powders.—(Fr. Poudre.) See also **Rouges.**

1. Poudre de Frangipane, Frangipanni Powder.—

Poudre de Chipre	¾ lb.
Poudre aux fleurs d'oranges	¾ lb.
Essence of ambergris	1 fl. drm
Civet (in fine powder)	4 or 5 grn.

Proceed as for poudre de Montpellier (ante).

2. Poudre á la Maréchale.—

Cyprus powder	1 lb.
Starch or farina	½ lb.
Calamus aromaticus (root)	1 oz.
Cloves	1 oz.
Cyperus perennis or rotundus	1 oz.

Separately powdered and mixed, as before. Pale ash gray.

3. Starch or farina | 2 lb.
Cloves | 1 oz.
Orris root | ¾ oz.
Essence of ambergris (or royale) | 20 drops.

As before. White.

4. Poudre de Millefleurs, Millefleur Powder.—

Poudre de Chipre	1½ lb.
Eau or extrait de millefleurs	1½ fl. drm

Mix, as before. On the large scale, the solid and liquid scents employed to make the eau or extrait are directly added to the powder as in the poudres de Montpellier, Maréchale, etc.

5. Poudre á la Vanille.—

Cyprus powder	1½ lb.
Vanilla (in fine powder)	1½ drm.
Cloves (in fine powder)	½ drm.
Essence of ambergris	8 or 10 drops

Mix, as before. Or it may be made like poudre de millefleurs, by the simple addition of a little essence of vanilla to the plain powder.

6. Bran of Almonds.—Make an emulsion of 4 parts of sweet almonds, blanched, with 6 parts of water; press and dry the residue thoroughly. Rub to a powder, and add 1 part pulverized orris root.

7. Blanc de Circassie (Circassian White).—Make a slightly blued water with a little ultramarine, and dissolve therein a very small portion of powdered gum tragacanth. With this solution thin out a very finely powdered Venetian talc, and of this paste form troches or lumps by pushing the mass through the barrel of a glass funnel, and catching the drops upon white paper. When these drops are dry, they are gently loosed and packed separately in handsomely ornamented paper boxes, or in elegant china pots, similar to those for the red paints, but in this case a little juice of lemon should be added to give consistence.

8. Complexion Powder.—Violet.—

Best starch	25 lb.
Terra alba	25 lb.
Talc (without mica)	25 lb.
French chalk	25 lb.
Pulverized orris	10 lb.

Grind well together with 8 oz. Turkish geranium oil, 2 oz. oil of citronella, then sift through fine wire sieve.

For flesh tint.—Add to 2 lb. of the violet powder 8 oz. carmine. Triturate carefully and completely; when thoroughly ground, add violet powder until the desired color is obtained.

9. Harmless Cosmetic Powders.—The *Journal of Pharmacy* announces the fact that the apothecaries of Copenhagen have agreed on the substitution of certain harmless compounds for the numerous poisonous face powders now commonly used. In avoirdupois weight, the proportions of the ingredients will be about as follows: For white powder, oxide of zinc, 1 oz.; wheat starch, 9 oz.; oil of rose, 3 drops.

10. For Red Powder.—Carmine, 1 oz.; carbonate of magnesia, 4 oz.

11. Rose Face Powder.—Rice starch, 7 lb.; rose pink, ½ drm.; otto of rose, 2 drm.; otto of santal, 2 drm.

12. Poudre de la Mer Rouge, by Cambou, Paris.—

Alum	1 lb.
White sugar	1 oz.
Gum arabic (best)	1 oz.
Carmine	1 oz.

Mix and reduce the whole to an impalpable powder, and sieve through a fine cloth.

This powder, its author says, is curative of the ringworm, red blotches and pimples.

It is tied up loosely in a bag, and this bag, moistened with fresh water, is rubbed gently over the skin.

13. Face Powder.—Starch, 1 lb.; oxide of bismuth, 4 oz. The use of bismuth cannot be too strongly reprehended.

14. Enamel Powder.—

Talc or French chalk (finely scraped)	1 part.
Pearl white	1 part.
Rouge or carmine (to slightly tinge it)	q. s.

Mix. Used to conceal discolorations, and, without the coloring, to whiten the skin.

15. Poudre Orientale.—

Peeled sweet almonds	2	lb.
Rice flour	4	oz.
Orris root	4	oz.
Benzoin	4	oz.
Spermaceti	3	drm.
Potassium carbonate	3	drm.
Volatile oil of rhodium wood	30	drops.
Volatile oil of lavender	30	drops.
Volatile oil of cloves	30	drops.

Mix the whole and sieve finely. This powder is very mild and agreeable.

16. Poudre d'Iris, Absorbent Powder.—

Powdered orris root	12	lb.
Powdered bergamot peel	8	oz.
Powdered acacia flowers	8	oz.
Powdered cloves	½	oz.

Mix and pass through a sieve. The labels accompanying the boxes in which this powder is packed should direct its application at evening, and its removal from the hair with a fine tooth comb the following morning.

17. Pearl White, Pearl Powder.—This, as already noticed, is properly the basic chloride or subchloride of bismuth. It is a pearly white, inodorous powder. To obtain it in the greatest beauty, it should be precipitated from a rather concentrated acid solution of the metal, and should be dried at a very gentle heat in the shade. The continued use of either of the above bismuth whites injures the skin, and ultimately produces paralysis of its minute vessels, rendering it yellow and leather-like—an effect which, unfortunately, those who employ it generally attempt to conceal by its freer and more frequent application. The following is also often sold under the above name:

18. Pearl Powder, Cosmetic P. P.—Pure pearl white and French chalk or talc, equal parts, triturated together. It is generally preferred by ladies to pearl white alone, from being more adhesive. The French chalk, for this purpose, is said to be best reduced to powder by scraping it with Dutch rushes. Some makers add a little more chalk.

19. Perle Powder.—French chalk, 1 lb.; oxide of bismuth, 1 oz.; oxide of zinc, 1 oz.

20. Toilet Powder, Skin Powder.—

Starch or farina (in fine powder)	1	lb.
Orris root (do.)	½ to ¾	oz.
Essence of ambergris	10	drops.
Oil of bergamot	10	drops.
Oil of rhodium	2	drops.

Mix thoroughly, and rub the whole through a fine gauze sieve. Very fine. It should be put up in packets of thin non-porous pasteboard, and packed moderately close, to prevent loss of odor.

21. Powdered starch or farina 1½ lb.
Oil of bergamot ½ fl.drm.
Oil of cloves } 12 to 15 drops.

As before. This forms the common powder of the shops.

22. Pistachio Nut Toilet Powder.—Starch of pistachio nuts, 7 lb.; French chalk in fine powder, 7 lb.; otto of rose and lavender, each 1 drm. Well sifted through a fine sieve.

Curry (Currie) Powder.—1. Coriander seeds, 20 parts; black pepper, 3 parts; cayenne pepper, 1 part; turmeric, 6 parts; cummin seeds, 6 parts. Reduce to powder and mix.

2. The *Food Journal* indorses the following recipe as affording the closest approach to a Singapore curry powder that can be obtained outside of the tropics:

One coconut and one lime sliced.		
Cardamoms, thoroughly ground	2	oz.
Cinnamon, thoroughly ground	2	oz.
Chillies, thoroughly ground	1	oz.
Coriander seed, thoroughly ground	4	oz.
Black pepper, thoroughly ground	4	oz.
Mustard seed, thoroughly ground	2	oz.
Turmeric, thoroughly ground	5	oz.
Ginger, thoroughly ground	4	oz.

3. Ford's.—Turmeric, 12 oz.; coriander seed, 12 oz.; ginger, 12 oz.; black pepper, 12 oz.; capsicums, 9 oz.; cardamoms, 6 oz.; cummin seed, 6 oz.; mint, 3 oz. These should be ground separately into fine powder, and weigh as above after being ground. Mix thoroughly by sifting all together.

Dusting Powders.—McCall Anderson's Dusting Powder.—The powder, after being well triturated, should be bolted.

Camphor	3	drm.
Zinc oxide	4	drm.
Starch	16	drm.

Flash Light Powder. See **Photography.**

Fly Powder.—Prep. White arsenic, 4 oz.; white sugar, 6 lb.; rose pink, 1 oz.; mix, and put 6 drm. in each paper. It is poisonous, and should be employed with great caution, especially where there are children.

Infusorial Earth as a Dusting Powder.—Infusorial earth, sterilized by being subjected to a heat sufficient to cause it to glow, constitutes, it is said, an excellent inert dusting powder. It is capable of absorbing about six times its own weight of water. Mixtures of equal parts of this earth, thus dried, with salicylic acid, salol, or iodoform, have proved of equal use.

Foot Powder.—Dr. Oscar Bernar, Vienna.—An unfailing remedy for sweaty feet and bad odor of the feet. Powdered alum, 21 parts; maize meal, 1 part.

Glove Powder.—1. Castile soap, dried by exposure to a warm, dry atmosphere for a few days, and then reduced to fine powder in a mortar. Used to clean gloves.

2. Pipe clay, colored with yellow ocher, umber, or Irish slate, q. s., and afterward scented with a little powdered orris root, or cloves. Used to color gloves made of doeskin and similar leather.

Gold Powder.—Pulvis Auri.—Triturate gold leaf with ten or twelve times its weight of sulphate of potash, till bright particles are no longer visible; pass it through a sieve; mix with boiling water, wash what remains on the filter and dry in a stove.

Gunpowder.—The composition of powder is varied considerably to adapt it to special usage. Theoretically the proper composition for a powder in which the full force of a completed reaction between the ingredients employed would take place would be:

Niter (pure)	74·64
Carbon (pure charcoal)	13·51
Sulphur (pure)	11·85
	100·00

In practice, however, the following are found best adapted for the several purposes indicated:

	Niter.	Char.	Sul.
For U. S. military service	76	14	10
For sporting	78	12	10
For blasting	62	18	20

Of course much depends upon the thoroughness with which these ingredients are mixed together, granulated, and dried. But the manufacture is one attended with great danger and should not on that account be attempted.

Powder, Power of.—In small blasts, 1 lb. of powder will loosen about 4½ tons; in large blasts, 1 lb. of powder will loosen about 2¾ tons. One man can bore, with a bit 1 in. in diameter, from 50 in. to 100 in. per day of ten hours in granite, or 300 in. to 400 in. per day in limestone.

Hair Powder.—(Son preparé et perfumé).—1. For cleaning the hair. Powder very finely and carefully the bran of wheat, perfectly and absolutely dry, and, to every pound add 2 oz. powdered orris, and pass through a sieve.

2. Hair Wash Powder.—Powdered borax, 1 lb.; camphor, 1 drm.; oil of bergamot, 20 min. Mix.

3. Poudre Blonde (for the hair).—Add yellow ocher to the best pearl starch, finely powdered, until the desired shade is obtained.

4. Starch (finely powdered), 1½ lb.; orris root, ½ oz.; oil of rhodium, 5 drops.

5. Plain or Unscented Hair Powder.—Pure wheat starch.

6. Starch reduced to very fine powder, and then scented according to the fancy; it is lastly passed through a gauze sieve. In its simple form without any addition it constitutes plain hair powder. In other cases, it is distinguished by the name of the substance added to perfume it. Thus we have rose hair powder, violet hair powder, etc. Potato farina, well triturated, is now commonly used for hair powder.

7. Poudre de Gomme (for false toupets).—Powder equal parts of gums arabic and tragacanth, and add ¼ of powder of orris, or white perfumed powder, with ⅛ of pulverized sugar candy. When used this composition is to be made into a pasty consistence with a sufficient quantity of water.

Hand Powder.—Almond paste, and other like cosmetic powders, often receive this name. The product of the following formula is also much esteemed among the higher classes: Take of—

Almond powder	1 lb.
Cuttle fish bone (powdered)	5 oz.
Curd soap (air dried, powdered)	2½ oz.
White Castile soap (air dried, powdered)	2½ oz.
Orris root (in fine powder)	1½ oz.

Mix and pass the whole through a fine sieve. Used to clean, soften, and whiten the hands, and to prevent chaps and chilblains.

Insect Powder, Constituents of.—M. Lacour Eymard communicates to *L'Union Pharmaceutique* the results of an investigation which he has concluded on Dalmation insect powder, the object being to ascertain why some powders of commerce differ from the proprietary powders. A portion of the powder was first submitted to the ordinary process for the distillation of essential oil, and a distillate was obtained which was opaque, owing to the presence of a very small quantity of essential oil, possessing the characteristic odor of the flowers. Some bugs and ants were put along with a portion of this odorous substance under a bell glass, but after eight hours they were as lively as ever, entirely unaffected by the volatile essence. M. Jousset de Bellerme has already shown that the essential oil of *Pyrethrum carneum* is without influence on insect life, and the same is also true of the pyrethrum of the Caucasus. We may recall the fact that Hirschsohn has recently come to the same conclusion. Continuing his work, M. Eymard extracted the resinous matter of the powder by means of ether, obtaining 5·6% of dry product, 3·8 of it being fatty matter and 1·8 resin. An alcoholic solution of the entire residue was placed on paper, the alcohol allowed to evaporate, and some insects placed on the paper. Immediately the insects showed symptoms of much agitation, and within five minutes they died. A solution of the resin alone had exactly the same effect. Alcoholic and aqueous extracts of the powder were also made, but these proved to be innocuous to insects, and M. Eymard concludes that there is no doubt that it is the ether-soluble resin which is the insect killing constituent, and that the finer the powder is, the more active it is. The following is the result of the complete analysis of the powder:

Essential oil	A trace.
Fatty bodies, soluble in ether	3·8%.
Resin, soluble in ether	1·8%.
Brown resin, soluble in alcohol	4·2%.
Vegetable albumen	1·75%.
Gummy matter	14·75%.
Inulin and starch	8·5%.
Mineral salts	7·88%.
Woody matter	56·72%.

The ash — 7·885% — consisted of potassium chloride, 1·94; calcium carbonate, 4·15; calcium phosphate, 0·17; silica and iron, 1·625. A mere trace of iron was only found. In a recent investigation Messrs. Schlagdenhaufeen & Reeb ascertained that the active principle of pyrethrum flowers is an acid (pyrethrotoxic acid) soluble in alcohol, amylic alcohol, ether and chloroform, which may be isolated by means of ether after having been converted into an alkaline salt and decomposed by tartaric acid in aqueous solution. Apparently this is the resin above mentioned.

Lycopodium Powder.—An absorbent and for excoriated surfaces in infants. Lycopodium ½ lb.; rose or violet toilet powder, 1 lb.

Magnesium Powder.—

Chlorate of potash	3 parts.
Perchlorate of potash	3 parts.
Magnesium powder	4 parts.

Meen Fun (Chinese Skin Powder).—Magnesian earth—very absorbent.

Powder, Ink. See **Inks.**

Moth Powder.—Lupulin (flour of hops), 1 drm.; Scotch snuff, 2 oz.; gum camphor, 1 oz.; black pepper, 1 oz.; cedar sawdust, 4 oz. Mix thoroughly and strew, or put in papers, among the furs or woolens to be protected.

Nail Powder.—The nails should be cut at least once in two weeks. A sharp penknife produces a smoother edge than scissors. Some persons push the quick down with the towel every time they wash their hands, but small ivory nail cleaners are preferred. The best nail powder consists of pure oxide of tin perfumed with otto of lavender and tinted with carmine.

Polishing Powder. See **Polishing.**

Putz Powder. See **Polishing.**

Sachet Powders.—The material is either to be ground in a mill or powdered in a mortar, and afterward sifted.

1. Acacia Sachet.—Cassie flower heads, 1 lb.; orris powder, 1 lb.

2. Scent Powder.—The following recipe for scent powder to be used for wardrobes, boxes, etc., gives an article far superior to the mixtures sold in the shops: Coriander, 1 oz.; orris root, 1 oz.; rose leaves, 1 oz.; and aromatic calamus, 1 oz.; lavender flowers, 2 oz.; rhodium wood, ¼ drm.; musk, 5 grn. These are reduced to a coarse powder. The scent on the clothes is as if all fragrant flowers had been pressed in their folds.

3. Take of reindeer moss, in coarse powder, any quantity, and very strongly scent it with any of the compound fragrant essences, or with the perfumes of which they are made, or with mixed essential oils, at will.

4. Orris root (in coarse powder)	2 oz.
Cassia (in coarse powder)	1½ oz.
Cloves (in coarse powder)	1 oz.
Cedar wood (rasped)	¼ oz.
Yellow sandal wood (rasped)	¼ oz.
Ambergris (in fine powder)	5 or 6 grn.
Musk (in fine powder)	5 or 6 grn.
Mix, add of—	
Oil of lavender (Mitcham)	1 drm.
Oil of bergamot	1 drm.
Otto of roses	10 to 15 drops.

And blend the whole thoroughly together.

5. Coriander seed	4 oz.
Orris root	4 oz.
Calamus aromaticus (root)	4 oz.
Rose leaves (lightly air dried)	4 oz.
Lavender flowers (lightly air dried)	8 oz.
Rhodium wood (rasped)	1½ to 2 drm.
Musk (powdered)	15 to 20 grn.
Civet (powdered)	10 or 12 grn.

As before.

6. As the last, but adding of—

Allspice	1½ oz.
Cloves	½ oz.
Mace	¼ oz.
Oil of lavender (Mitcham)	½ drm.

Replace the musk and civet, in Nos. 5 and 6, by essential oil of almonds, 1 fl. drm.

7. Patchouli

	8 oz.
Lavender flowers (lightly dried)	3 oz.
Orris root	2 oz.
Cloves	1 oz.
Oil of bergamot	1 fl. drm
Oil of lavender (Mitcham)	½ fl. drm
Essence of ambergris	½ fl. drm
Essence of musk	½ fl. drm

The above are used, along with cotton wool, to fill scent bags, cassolettes, etc., and as scent powders for boxes, drawers, wardrobes, and the like. For the latter, besides their fragrance, they are useful in keeping away moths and other insects. They are also used beaten up with mucilage, to form scent balls, medallions, etc.

8. Sachet au Chypre.—Ground rose wood, 1 lb.; ground cedar wood, 1 lb.; ground santal wood, 1 lb.; otto of rose wood, 3 drm. Mix and sift.

9. Frangipanni Powder.—

Powdered violet roots	3 lb.
Powdered sandal wood	¼ lb.
Orange oil	1 drm.
Rose oil	1 drm.
Oil of sandal wood	1 drm.
Pulverized musk	1 oz.
Pulverized civet	2 drm.

10. Sachet of Heliotrope.—Take—

Powdered orris root	2,000 parts.
Powdered rosa centifolia	1,000 parts.
Powdered tonka bean	500 parts.
Cut vanilla bean	250 parts.
Powdered musk	10 parts.
Essential oil of bitter almonds	1 part.

Pound the musk and vanilla bean together, and add the rest. Pass through a not close sieve. This is an excellent imitation of heliotrope.

11. Sachet of Lavender.—This and the two following recipes are from Piesse. Take—

Powdered lavender	75 parts.
Powdered benzoin	20 parts.
Essential oil of lavender	1 part.

Mix.

12. Sachet for Perfuming Linen.—Take—

Orris root	125 parts.
Rosa centifolia	125 parts.
Nutmegs	8 parts.
Grain musk (Hibiscus abelmoschus)	15 parts.

Powder coarsely and mix.

13. Sachet a la Maréchale.—Take—

Sandal wood	280 parts.
Orris root	280 parts.
Rosa centifolia	140 parts.
Cloves	140 parts.
Cassia bark (Laurus cassia)	140 parts.
Musk	1 part.

Powder coarsely.

14. Mousseline Sachet.—Vitivert in powder, 1 lb.; sandal wood, orris, each, ½ lb.; black currant leaves (casse), ½ lb.; benzoin in powder, ¼ lb.; otto of thyme, 5 drops; otto of roses, ½ drm.

15. New Mown Hay.—Sachet Powder.—Ground rose leaves, 1½ lb.; ground orange flowers, ¾ lb.; ground orris root, 1½ lb.; ground benzoin, ¼ lb.; ground Tonquin bean, ¾ lb.; ground ambrette, ¾ lb.; oil of verbena, 1½ drm.; oil of almonds, 3 drm.

16. Patchouly Sachet.—Patchouly herb, ground, 16 lb.; otto of patchouly, ¼ drm.

17. Portugal Sachet.—Dried orange peel, 1 lb.; dried lemon peel, ½ lb.; dried orris root, ½ lb.; otto of orange peel, 1 oz.; otto of neroli, ¼ drm.; otto of lemon grass, ¼ drm.

18. Rose Powder.—

Pulverized rose leaves	1 lb.
Pulverized sandal wood	½ lb.
Rose oil	2 drm.

19. Rose Sachet.—Rose leaves, 1 lb.; sandal wood, ground, ½ lb.; otto of roses, ¼ oz.

20. Patchouli Powder.—

Pulverized patchouli leaves	1 lb.
Patchouli oil	1 scr.

21. Verbena Powder.—

Dried and pulverized lemon peels	1 lb.
Caraway seeds	¼ lb.
Oil of lemon peels	4 drm.
Oil of bergamot	1 oz.

22. Verveine Sachet.—Lemon peel, dried and ground, 1 lb.; lemon thyme, ¼ lb.; otto of lemon grass, 1 drm.; otto of lemon peel, ½ oz.; otto of bergamot, 1 oz.

23. Violet Powder.—The London *Chemist and Druggist* gives this recipe: Powdered starch or potato farina, 28 lb.; orris powder, 1 lb. This will require about 1 oz. of perfume, varying according to fancy. A mixture of ambergris and bergamot, with a little musk, is a favorite odor, and some makers add a few drops of oil of rhodium. The powder should be sifted.

24. Violet Satchet.—Black currant leaves, 1 lb.; cassie flower heads, 1 lb.; rose leaves, 1 lb.; orris root powder, 2 lb.; otto of almonds, ¼ drm.; grain musk, 1 drm.; gum benzoin in powder, ½ lb. Mix the ingredients well by sifting. Let them stand for a week in a glass jar before using.

25. Violet Powder, Perfume for.—

Bergamot oil	20 parts.
Lemon oil	20 parts,
Clove oil	10 parts.
Neroli	10 parts.

Use equal parts of powdered orris root and starch, and add 1 drm. of this to each pound of powder.—*Druggists' Circular.*

Seidlitz Powders.—Pulveres Effervescentes Aperientes.—1. Potassio-tartrate of soda (Rochelle salts), 2 drm.; bicarbonate of soda, 40 grn.; mix, and put in a blue paper. Tartaric acid, 35 grn., to be put in a white paper. For about ½ pt. of water. Laxative.

2. In one bottle. Potassio-tartrate of soda, 12 oz.; bicarbonate of soda, 4 oz.; tartaric acid, 3½ oz.; white sugar, 1 lb. (all in fine powder); dry separately by a gentle heat, add essence of lemon, ½ drm.; mix well, pass the mixture through a sieve, and put it at once in clean, dry bottles. A dessertspoonful or more to a tumblerful of water.

3. Cut blue and white paper to form powders. Into the blue papers put 1 drm. bicarbonate of soda and 2 drm. Rochelle salts intimately mixed. The white powder contains ½ drm. tartaric acid. For use, dissolve a white powder each in half a tumbler of water. Mix and drink while it effervesces.

Soap Powder. See **Soaps.**

Stamping Powder.—Powdered talc is good for marking cloth. For blue marks on white goods use ultramarine blue.

Tooth Powder. See the **Teeth.**

Washing Powder (Toilet); Alkalized Cosmetic Powder.—Several preparations used in fashionable life by ladies instead of soap. The following are intended chiefly to soften the water used in making one's toilet, and thus to promote its cleansing action, as well as the free lathering of the soap:

1. The best Scotch soda broken up small and exposed (spread out) in a warm dry situation until it effloresces and falls into the state of a

fine white powder. Half a teaspoonful or thereabout to be added to ½ or ⅛ of an ordinary wash basinful of water.

2. (Dutch Washing Powder.) Powdered borax. A good pinch as above.

3. Carbonate of soda (or effloresced Scotch soda)..... ¾ lb.
Borax (in fine powder)..... ¼ lb.

Mix. Used as No. 2. The above are perfectly harmless to the skin and promote its health and clearness. The last two, when daily used, also tend to render it soft and white and to prevent roughness, chaps, etc.

Welding Powder. See **Welding.**

Precipitation.—A process in which an agent, usually in a fluid condition, being added to a compound or a menstruum, a new compound is separated and thrown to the bottom of the vessel in the form of a fine powder. The fluid added to produce the precipitation is called a precipitant. This should be added gradually, stirring the mixture continually with a glass rod, until the precipitation ceases. The liquid should then be allowed to settle until clear. In order to ascertain whether there is any matter left in the liquid unprecipitated, let one drop of the precipitant fall into the mixture; if any signs of precipitation ensue, more must be added; if the mixture remains unchanged and clear, the operation is complete. The liquid may then be carefully decanted and the precipitate filtered, washed and dried.

Precipitate.—Any substance which has separated from its solution in a solid and usually a pulverulent or flocculent form. This substance is called a precipitate. This is of great importance in chemistry, as chemical analyses depend on the formation of precipitates almost entirely in the determination of substances.

Preserving. See also **Eggs, Furs and Skins, Meat, Wood, Salicylic Acid.**

Preserving Media. See **Microscopy,** etc.; also **Antiseptics.**

Beer.—Acid sulphite of lime is recommended to be added to beer which has to be kept for a length of time in warm places, or to undergo transmarine exportation; 1 gal. of the aqueous solution (commercial) is added to 1,000 gal. beer.

Fruit, Grain and Vegetables.—For the preservation of grain no further precautions are necessary beyond gathering it when ripe and keeping it dry.

Canning Fruit.—The Pomona *Times* publishes the following detailed statement:

A word or two as to the philosophy or science of canning will not be amiss, for it is founded on scientific principles, and there may be many modifications in the methods of securing the results desired, so that methods may, in many instances, be modified by circumstances.

There may be said to be two causes for the fermentation and decay of fresh fruit. Everywhere in the atmosphere there are little floating germs which attach themselves to cut fruit, causing fermentation. The oxygen of the air is also ready to enter into combination and produce decay. The first of these causes the strongest influences in starting the processes of decay.

Canning checks the process from the fact that a boiling heat kills all the germs of ferment; and, by closely sealing, no more can enter, nor can the oxygen of the air gain access to the fruit to act upon it.

It has been found that the germs will not go through a sheet of cotton batting, and fruit has been preserved by closing it pretty tight, to prevent evaporation, and wrapping the joint loosely with cotton.

Fruits are in a proper condition to can when they are fully ripe, but not soft and mushy. They can be canned at any time before they are too ripe, but at the expense of a fine appearance. Many of our canneries sacrifice quality in taste and flavor to quality in appearance. The home canner will seek the best flavor and make the fruit look as well as he can.

Glass is of course best, but tin cans will keep fruit just as well, with a slight danger of the acid of the fruit dissolving a portion of the tin.

If no regard is had for fine appearance, the easiest way to can is to cook the fruit in a porcelain or graniteware kettle, in small quantities, two to five cans at a time, and when cooked pour into cans and seal at once.

If the finest appearance is desired, all fruit that is peeled or cut should be at once dropped into water to keep it from discoloring. By the aid of a silver spoon or knife the pieces can be arranged in the can systematically and regularly, and the can should then be shaken down as solid as possible by gently jolting on the table. It should be filled with sirup. We leave the amount of sugar in this sirup to the taste of each man. We prefer for most fruits a good strong sirup, but all do not. The filled cans should now be placed in a boiler with water enough to come up nearly to the neck and covers put loosely on, and the whole brought to boil and kept long enough to cook thoroughly. The time varies. The following table is said to be a good guide:

Fruit.	Time for boiling.	Sugar to qt. of fruit.
Cherries	5 min.	6 oz.
Raspberries	6 min.	4 oz.
Blackberries	6 min.	4 oz.
Strawberries	8 min.	8 oz.
Plums	10 min.	10 oz.
Whortleberries	5 min.	8 oz.
Pie plant	10 min.	8 oz.
Sour pears (whole)	30 min.	4 oz.
Bartlett pears (halves)	20 min.	6 oz.
Peaches (halves)	8 min.	4 oz.
Peaches (whole)	15 min.	4 oz.
Pineapples (sliced)	15 min.	6 oz.
Crab apples	25 min.	8 oz.
Sour apples	10 min.	5 oz.
Ripe currants	6 min.	8 oz.
Gooseberries	8 min.	8 oz.
Wild grapes	10 min.	8 oz.
Quinces (sliced)	15 min.	10 oz.
Tomatoes	20 min.	½ teaspoonful of salt.

The fruit will shrink considerably in cooking, and a few pieces should be cooked in a separate dish to fill up with if there is a chance. If this extra dish is cooked with a little more sugar than the rest, it is a good idea. As soon as the cans are cooked enough, remove them from the water, take off the covers and fill the cans as full as possible, the top with boiling hot sirup; wipe the top and neck clean, put on the rubbers, and screw down the tops as tight as possible. Watch the rubbers carefully to see that the tops fit them well.

It is sometimes necessary to test the zinc covers of the Mason jar, by placing them on a smooth, flat surface, and if the edge does not come down close all the way round, it can be pressed down by rubbing it with a smooth iron.

Set the fruit away where you can watch it for a week, and if you discover no fermentation, it can be put in a dark place to keep. Move it as little as possible after this. If you have any doubts about any can being perfectly sealed, you can wrap the top in cotton and it will be apt to keep as well as any. Apricots, peaches, nectarines, and pears should be as ripe as possible and still keep their shape.

If you fill cans with hot cooked fruit, they will not break if you stand them on a wet folded cloth while filling.

Jellies are delicious, and can be made of most kinds of fruit. Currants are very nice, and a

few raspberries with them give the whole a raspberry flavor. Blackberries, apricots, plums, apples, quinces, and grapes before they are fully ripe make excellent jelly. Some small egg plums and some Verdel grapes gave us some fine jelly, very light in color, and tart. Cook the fruit in a little water, and the juice which will drain out without pressure is nicest. By straining twice through a flannel bag, the juice that comes from pressure is made about as clear and nice as any.

Quinces may be pressed gently for a portion of their juice, and the pulp mashed and rubbed through a sieve or one of those crushers made on purpose, and with the addition of sugar made into a nice marmalade. Jellies will be lighter colored to boil the juice alone before adding the sugar. You will need about equal bulks of juice and dry sugar to make good jelly glasses. The best cover we have ever found is melted paraffine. The glasses should be allowed to be open, or lightly covered for a day or two to shrink; then pour the melted paraffine on top and let it cool. The hot paraffine kills all germs of mould or ferment and keeps it air tight. The name of the jelly may be written on the smooth surface of the paraffine when cold. It will come off as neatly as a glass cover. If you do not use paraffine, cover the top with a wax paper neatly cut to circular form the exact size of the glass and pressed down to the jelly. Then put on the regular cover.

Crystallized Fruit.—This can be made at home very nicely. Select nice, firm fruit. Cook it a little in clear water, the amount of cooking you will soon learn. Place the cooked fruit into very thick, hot sirup, and let it stand for about two days; then drain off the sirup, which will now be very thin, and boil it down until it is thick again, put in the fruit and let it heat through and stand for about four days, then repeat the process, letting it stand longer every time. When the sirup no longer gets thin, remove the fruit and dry it in the sun or in an evaporator with gentle heat. It may be rolled in granulated sugar to fully dry it, and then may be packed in boxes for use. By using the first sirup for jelly, and making up some entirely new, the process can be hastened and the fruit will dry better, but will not be of quite so good a flavor. Try it.

Fruit Juices.—Formic acid is said to possess powerful preservative properties, exceeding, when added to acid solutions, even carbolic acid, and to be particularly suitable for adding to fruit juices; about ¼ to ⅛ is the quantity requisite to preserve fruit juices, vinegar, glue, ink, etc.

Cooking.—The preservation of vegetables by cooking them in sealed cases is dependent upon the destruction of all organic germs by the heat of the boiling and the perfect exclusion of air. An example of the simplest form is the canning of tomatoes. The fruits are scalded to loosen the skin, and then dipped in sieves into water, heated by the injection of steam, for one-half minute. They are then skinned, and picked over, and passed into the steamer. Thence they fall into the hopper, and are fed by the stuffer, a cylinder worked by a treadle, into the cans. The filling of these is adjusted by boys, and they are sealed up. The cans are then boiled for two hours, then partially cooled, the air is let out by a pin hole, and they are immediately soldered up, and the cooling is completed.

Many other vegetables are canned in a similar manner. Those which have a green color lose it during the operation, by the destruction of the chlorophyl. The same remark applies to those dried by heat. The green color may be replaced by adding a solution of chlorophyl.

Desiccation.—The simplest form of desiccation is by ordinary sun and wind drying, as conducted in hay making. The next step is by radiated sun heat, as in coffee drying; a further advance is made by the application of artificial heat, as in hop drying and tea drying. The primary object in all these cases is the removal of the water mechanically present, and without whose presence fungoid growths and decay cannot exist. As a curative agent simply, the application of heat is, however, unnecessary and injurious, causing a partial destruction of the flavor, and more or less fermentative change. Research has proved that between the limits of 32° and 60° F. (0° and 15° C.) vegetable substances retain their flavor and all other qualities, while giving up their moisture, no fermentative action being engendered. This has led to the adoption of the following:

Cold Blast System.—The fruit or vegetables are deprived of moisture by subjection to dried air at a low temperature. The air is compressed in a chamber containing chloride of calcium or any other compound possessing strong dehydrating qualities. Chloride of calcium is in practice probably the best, as it so readily gives up the absorbed water on being heated. The compressed and dried air is then admitted into a chamber containing the substances to be treated. The expansion lowers its temperature somewhat, which should be maintained between 32° and 60° F. (0° and 15° C.). The substances are distributed throughout this chamber on perforated trays, so as to be fully exposed to the current of cold dry air passing through. All the moisture is thus removed, without the least detriment to the flavor, color, and other virtues of the substance acted upon. The process has a great advantage over hot drying, both in the cost entailed and the result achieved. Fruit and vegetables thus prepared, and packed with ordinary care, remain good for an indefinite period, and resume their natural shape and dimensions when placed in water.

Masson and Gannal's Process.—Vegetables are submitted for a few minutes to steam at 70 lb. a sq. in., then dried by air at 212° F. (100° C.), subjected to hydraulic pressure so as to form tablets, and, when required for use, are soaked in cold water for five hours.

Hot Air Process.—1. Great quantities of vegetables continue to be prepared by this process, which has been in use for some time by Whitehead and other well known firms. A common method of conducting the operation is as follows: The fruit or vegetable is pared and cored, if necessary, and then finely shredded. The shreds are spread on galvanized iron wire screens in the evaporator, a three storied chamber, through which passes a current of air heated to 240° F. (116° C.). The screens rest on endless chains, that move upward at intervals of three to five minutes, when a fresh screen is put on below, and a finished one is taken off at the top. The evaporation is very rapid. The cores and peelings of apples, etc., are made into vinegar.

2. Another plan is by means of a vacuum pan, heated to 120° to 170° F. (49° to 77° C.). The air is dried by passage over chloride of calcium. The operation occupies twenty minutes.

Carsten's Process for Potatoes.—The potatoes are peeled and cut into disks, and are scalded by immersion in nearly boiling water. They are then dried hard in an oven. To preserve the white color, they are treated with water acidulated with 1% of sulphuric acid. They are then washed in cold water, and dried.

Sacc's Process.—Sacc's process for preserving vegetables is as follows: The vegetables are warmed to destroy their rigidity, and are then packed in barrels, and surrounded with one-fourth their weigh of acetate of soda in powder, by which their moisture is obsorbed. In summer the action is immediate; but in winter it may be necessary to put the barrels into a room heated to 68° F. (20° C.). After twenty-four hours, the vegetables are removed, and kept in a dry atmosphere. For use, they are soaked in cold water for twelve hours.

Furs and Skins, to Preserve. See **Furs and Skins** as well as the following.—1. The following is Dr. Lettsom's recipe for a mixture found to answer both for animals in cases and skins, in the open air. For birds it is equally good and effective: Corrosive sublimate, ¼ lb.; saltpeter, prepared or burnt, ½ lb.; alum, burnt, ¼ lb.; flowers of sulphur, ½ lb.; camphor, ¼ lb.; black pepper, 1 lb.; tobacco, ground coarse, 1 lb. Keep in glass stoppered bottle. Give two or three good rubbings with it.

2. Swan Skin.—Six oz. arsenic, 3 oz. corrosive sublimate, 2 oz. yellow soap, 1 oz. camphor and ½ pt. 90% alcohol. Put all these ingredients in a saucepan, which place over a slow fire, stirring the mixture briskly till the several parts are dissolved and form one homogeneous mass. This may be poured into a wide mouthed bottle, and allowed to stand till quite cold, when it will be ready for use. Of course these quantities may be increased or decreased, according to the size of the animal or bird to be operated on. If the soap and arsenic are left out, it will answer better, as they leave it greasy. To be put on with a sponge fastened on the end of a stick. Use very cautiously; mark poison.

India Rubber.—To prevent India rubber materials from hardening and cracking they are steeped in a bath of melted paraffine for a few seconds, or several minutes, in accordance with the size of the articles, and then dried in a room heated to about 212° F. (100° C.).

Hempel, in the *Ber. Chem. Ges.*, says that the hardening of vulcanized India rubber is caused by the gradual evaporation of the solvent liquids contained in the India rubber, and introduced during the process of vulcanization. Guided by this notion, he has made experiments for a number of years in order to find a method for preserving the India rubber. He now finds that keeping in an atmosphere saturated with the vapors of the solvents answers the purpose. India rubber stoppers, tubing, etc., which still possess their elasticity, are to be kept in vessels containind a dish filled with common petroleum. Keeping in wooden boxes is objectionable, while keeping in airtight glass vessels alone is sufficient to preserve India rubber for a long time. Exposure to light should be avoided as much as possible. Old hard India rubber may be softened again by letting the vapor of carbon bisulphide act upon it. As soon as it has become soft it must be removed from the carbon bisulphide atmosphere and kept in the above way. Hard stoppers are easily made fit for use again in this manner, but the elastic properties of tubing cannot well be restored.

Leather.—There is nothing as good as castor oil for preserving leather. Applied once a month, or once or twice a week in snowy weather, it not only keeps the leather soft, but makes it waterproof. Copal varnish is the best thing to apply to the soles; but the latter should be thoroughly dry, and if they have been worn, they should be previously roughed on the surface before applying the varnish. Linseed oil is perhaps better than nothing, but it rots the leather; hence the objection to dubbings and other mix-ups of mutton suet, linseed oil, etc. With regard to castor oil, it may further be said that it does not prevent a polish being produced on the boots; and that leather so treated is avoided by rats, if even its proportion be only one third to two thirds tallow.

Milk.—1. A mixture of 2 drm. boracic acid with 3 drm. common salt, of which an addition of ⅔ drm. to 1 gal. of milk is said to increase its keeping qualities for twenty-four hours.

2. When milk contained in wire corked bottles is heated to the boiling point in a water bath, the oxygen of the included small portion of air under the cork seems to be carbonated, and the milk will, it is said, keep fresh for a year or two.

3. Glacialine.—According to Dr. Besana, this substance, which has met with so much favor in England and elsewhere as an antiseptic, especially for the preservation of milk, has the following composition: Boracic acid, 18 parts; borax, 9 parts; sugar, 9 parts; glycerine, 6 parts.

4. Morfit's Process.—In 1 gal. milk at 130° to 140° F. (55° to 60° C.) is dissolved 1 lb. gelatine; the mixture is left to cool to a jelly, when it is cut into slices and dried. The compound is used to gelatinize more milk, and this is repeated till the gelatine is in the proportion of 1 lb. to 10 gal. of milk.

Prince's Metal. See **Alloys.**

Peruvian Beer. See **Beers.**

Printers' Rollers.—1. Take an equal quantity of good glue and concentrated glycerine; soften the former by soaking in cold water, then melt it over the water bath, gradually adding the glycerine. Continue the heat until the excess of water has been driven off, meantime constantly stirring. Cast in brass or bronze moulds well oiled.

2. To 8 lb. transparent glue add enough water to cover it; let it stand with occasional stirring seven or eight hours. After twenty-four hours, all the water should be absorbed. Heat it in a water bath, as glue is always heated as soon as melted, and when both rise, remove from fire, and add 7 lb. molasses that has been made quite hot. Heat with frequent stirring for half an hour. The moulds should be clean and greased. Pour into moulds after it has cooled a little, and allow to stand eight or ten hours in winter, longer in summer. Some use far more molasses, three to four times above quantity, and less water. In this case, after soaking one to one and half hours, the glue is left on a board overnight, and then melted with addition of no more water, and three or four times its weight of molasses added. Two hours' cooking is recommended in this case.

3. Resin soap and small quantities of oil and earthy matters are occasionally introduced. The heating must be continued until the greater part of the water has been expelled, when the composition is ready for casting in copper moulds, oiled and warmed.

4. Best glue	10½	lb.
Black molasses or honey	2½	gal.
India rubber, dissolved in oil of turpentine	1	lb.
Venice turpentine	2	oz.
Glycerine	12	oz.
Vinegar	4	oz.

The above formula is given for the mysterious black composition, so durable and elastic, and known but to very few persons until recently. Purified India rubber only is used. To recast add 20 per cent. new material. The old home receipt is, 2 lb. best glue, soaked overnight, to 1 gal. of New Orleans molasses. Will not recast.

Printers, Varnish for. See **Varnishes.**

Printing Inks. See **Inks.**

Printing, Photographic. See **Photography.**

Prints.—(Ackerman's Liquor.) Use 4 oz. each of the finest pale glue and white curd soap; boiling water, 3 pt., 12 fl. oz.; dissolve, then add of powdered alum, 2 oz. Used to size prints and pictures before coloring them.

Prints, to Transfer. See **Transferring.**

Prisms, Cement for. See **Cements.**

Proofs, Correction of.—*Synopsis of Reader's Marks:*

[ ] This indicates that the line has to be indented one em of its own body.

A full stop or full point has to be inserted.

Trs. A transposition of a word or words.

Ital. Change Roman into italic. Also indicated by underlining the word or words to be in italic.

l. c. A capital or small capital to be changed to a lower case letter.

Rom. Change italic into Roman.

Cap. A lower case or small capital letter to be changed to a capital.

Sm. Cap. A lower case or capital letter to be changed to a small capital.

X A bad or battered letter.

Delete or expunge.

⊥ A space or quadrat standing high to be pushed down.

w. f. Denotes a wrong font letter.

Equal. Equalize spacing throughout the line.

⁋ The matter has something foreign between the lines, or a wrong font space in the line, causing the types to get crooked.

Do not try to correct the faults of hurried making-ready by a weak impression, and by carrying an excess of ink to hide the weakness. Excess of ink fouls the rollers, clogs the type, and makes the printed work smear or set off. A good print cannot be had when the impression is so weak that the paper touches barely the ink on the types and is not pressed against the types. There must be force enough to transfer the ink not only on to the paper, but into the paper. A firm impression should be had, even if the paper be indented. The amount of impression required will largely depend on the making-ready. With careful making-ready, impression may be light; roughly and hurriedly done, it must be hard. Indentation is evidence of wear of type. The spring and resulting friction of an elastic impression surface is most felt where there is least resistance—at the upper and lower ends of lines of type, where they begin to round off. It follows that the saving of time that may be gained by hurried and rough making-ready must be offset by an increased wear of type. That impression is best for preventing wear of type which is confined to its surface and never laps over ~~over~~ its edges. But this perfect surface impression is possible only on a large forme with new type, sound, ~~soft~~ packing, and ample time for making ready. If types are worn, the indentation of the paper by impression cannot be entirely prevented. Good presswork does not depend entirely upon the press or machine, neither on the workman, nor on the materials. Nor will superiority in any ~~one~~ point compensate for deficiency in another: new type will suffer from a poor roller, and careful making-ready is thrown away if poor ink be used. It is necessary that all the materials shall be good, that they should be adapted to each other and fitly used. A good workman can do much with poor materials, but a neglect to comply with one condition often produces as bad a result as the neglect of all.

If the foregoing facts are carefully studied many difficulties will be overcome in obtaining really good work.

Stet. Matter, wrongly altered, remains as it was. Dots are usually placed under the matter in question.

A space has to be inserted.

Space to be reduced.

A turned letter.

New par. or n. p. or [Commence a fresh line.

Run on. Sentence not to commence a new line, but to follow on previous matter.

When a superior letter or inverted comma is required to be inserted in the matter it is usually written over this sign.

⊂ The words or letters over which this is marked to be joined.

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Protein.—Name given to a substance which Mülder regarded as the original matter from which animal fibrin, albumen and casein were derived, but which is now considered as a product of the decomposition of those important principles by moderately strong caustic alkali.

Prussian Blue. See *Pigments*.

Pulleys, Rules for Calculating the Speed of.—The diameter of the driven being given, to find its number of revolutions.—

Rule.—Multiply the diameter of the driver by its number of revolutions, and divide the product by the diameter of the driven; the quotient will be the number of revolutions of the driven.

Ex.—Twenty-four in. diameter of driver×150, number of revolutions,=3,600÷12 in. diameter of driven=300.

The diameter and revolutions of the driver being given, to find the diameter of the driven, that shall make any given number of revolutions in the same time.—

Rule.—Multiply the diameter of the driver by its number of revolutions, and divide the product by the number of required revolutions of the driven; the quotient will be its diameter.

Ex.—Diameter of driver (as before) 24 in.×revolutions 150=3,600. Number of revolutions of driven required=300. Then 3,600÷300=12 in.

The rules following are but changes of the same, and will be readily understood from the foregoing examples.

To ascertain the size of the driver.—

Rule.—Multiply the diameter of the driven by the number of revolutions you wish to make, and divide the product by the required revolutions of the driver; the quotient will be the size of the driver.

To ascertain the size of pulleys for given speed.—

Rule.—Multiply all the diameters of the drivers together and all the diameters of the driven together; divide the drivers by the driven; the answer multiply by the known revolutions of main shaft.

Pulleys, to Cover with Paper.—Scratch the face of the pulley with a rough file thoroughly, so that there are no bright or smooth places. Then swab the surface with a solution of nitric acid, 1 part; water, 4 parts; for 15 minutes; then wash with boiling hot water. Having prepared a pot of the best tough glue that you can get, stir into the glue a half ounce of a strong solution tannic acid, oak bark, or gallnuts, as convenient to obtain, to a quart of thick glue; stir quickly while hot and apply to the paper or pulley as convenient, and draw the paper as tightly as possible to the pulley, overlapping as many folds as may be required. By a little management and moistening of the paper, it will bind very hard on the pulley when dry, and will not come off or get loose until it is worn out. Use strong hardware wrapping paper.

Pulleys, to Lag.—Cast iron pulleys may be lagged with leather without the use of rivets, by first brushing over the surface with acetic acid, which will quickly rust it and give a rough surface; then attach the leather to the face of the pulley with cement composed of 1 lb. of fish glue and ½ lb. of common glue.

Pulleys, Wood, to Harden.—1. Soft maple is often used in the construction of friction pulleys. If it is boiled in olive oil, it will prove beneficial in a number of ways. It will harden the timber and render it less liable to split, but at the same time the gear will slip more after such treatment.

2. Boil for eight minutes in boiled linseed oil.

Pulp (Wood), to Harden.—Various substances can be used to harden the pulp, such as glue, starch and gum arabic, tragacanth, etc. The dry pulp should be mixed with as thin mucilage as is possible to make it stick together when pressed. White clay or kaolin can be also mixed with the pulp to make it like a putty. The moulds should be slightly oiled to keep from sticking.

Pulverization.—This is generally performed with a mortar and pestle, or on a larger scale by stamping, grinding, etc. Some soft substances, as carbonate of magnesia, can be pulverized by simply rubbing through a sieve; some require soaking or steaming, others drying or desiccation before they can be pulverized; others require the addition of some other substance as an intermedium to aid in the operation. When a substance is required to be reduced to an impalpable powder, a slab and muller are used; this process is termed porphyrization.

Pumice Stone.—A gray porous stone found in the neighborhood of volcanoes. Its chief use is in polishing and in removing stains from the hands.

Pumps.—1. The ordinary speed to run a pump is 100 ft. of piston per minute.

2. Useful numbers for pumps. The square of the diameter multiplied by the stroke, multiplied by 0·7854, gives capacity of the pump cylinder in cubic inches; by 0·002833, in gallons; by 0·0004545, in cubic feet; by 0·02833, in lb. fresh water.

Punch.—Punch is a beverage made of various spirituous liquors or wine, hot water, the acid juice of fruits, and sugar. It is considered to be very intoxicating; but this is probably because the spirit being partly sheathed by the mucilaginous juice and the sugar, its strength does not appear to the taste so great as it really is. Punch, which was almost universally drunk among the middle classes about fifty or sixty years ago, has almost disappeared from our domestic tables, being superseded by wine. There are many different varieties of punch. It is sometimes kept cold in bottles, and makes a most agreeable summer drink.

1. Juice of 3 or 4 lemons; yellow peel of 1 or 2 lemons; lump sugar, ¾ lb.; boiling water, 3½ pt.; infuse ½ hour, strain, add porter ½ pt.; rum and brandy, of each ¾ to 1 pt. (or either

alone 1½ to 2 pt.) and add more warm water and sugar, if desired weaker or sweeter.

2. To Make Hot Punch.—Ingredients.—½ pt. rum, ½ pt. brandy, ¼ lb. sugar, 1 large lemon, ½ teaspoonful of nutmeg, 1 pt. of boiling water. Rub the sugar over the lemon until it has absorbed all the yellow part of the skin; then put the sugar into a punchbowl; add the lemon juice (free from pips), and mix these two ingredients well together. Pour over them the boiling water, stir well together, add the rum, brandy and nutmeg; mix thoroughly and the punch will be ready to serve. It is very important in making good punch that all the ingredients are thoroughly incorporated; and to insure success, the processes of mixing must be diligently attended to. Allow a quart for 4 persons; but this information must be taken *cum grano salis;* for the capacities of persons for this kind of beverage are generally supposed to vary considerably.

3. Cold Punch.—Arrack, port wine, water, of each 1 pt.; juice of 4 lemons; sugar, 1 lb.; mix.

Arrack Punch, Imitation.—Two or three preserved tamarinds dissolved in a bowl of any kind of punch will impart to it a flavor closely resembling arrack.

Brandy.—1. To 1 pt. Cognac brandy, ½ pt. of Jamaica rum, ½ pt. of peach brandy, add 2 lb. white sugar, 1 gill of lemon and 1 gill of lime juice; mix all well together, and add ice equal to 2 qt. of water; cut 2 lemons into thin slices, peel and slice thin 1 pineapple; add these to the punch and let stand to ripen and blend for 1 hour before using.

2. To 1 teaspoonful of raspberry sirup add 1 tablespoonful white sugar, 1 wineglass brandy, the same quantity of water, a small piece lemon, 2 slices of orange, 1 piece of pineapple. Fill the tumbler with shaved ice, shake well, and dress the top with berries in season; sip through a straw.

3. Take 3 doz. lemons, chip off the yellow rinds, taking care that none of the white underlying pith is taken, as that would make the punch bitter, whereas the yellow portion of the rinds is that in which the flavor resides and in which the cells are placed containing the essential oil. Put this yellow rind into a punch bowl, add to it 2 lb. of lump sugar, stir the sugar and peel together with a wooden spoon or spatula for nearly ½ hour, thereby extracting a greater quantity of the essential oil. Now add boiling water, and stir until the sugar is completely dissolved. Squeeze and strain the juice from the lemons and add it to the mixture; stir together and taste it; add more acid or more sugar, as required, and take care not to render it too watery. "Rich of the fruit and plenty of sweetness," is the maxim. Now measure the sherbet, and to every 3 qt. add 1 pt. of Cognac brandy and 1 pt. of old Jamaica rum, the spirit being well stirred as poured in. This punch may be bottled and kept in a cool cellar; it will be found to improve with age.

Claret.—1. To a large punch bowl half filled with broken ice add 2 lb. of pulverized sugar; 6 oranges cut crosswise into thin slices, 6 bottles of claret, and 1 bottle of champagne; mix well together and let stand for one hour before using.

2. Take 1 tablespoonful of sugar, a small slice of lemon, 2 or 3 slices of orange. Fill the tumbler with shaved ice, and then pour in the claret, shake well, and ornament with berries in season. Place a straw in the glass.

3. Take 1½ tablespoons sugar, 1 slice of lemon, 2 or 3 slices orange. Fill the tumbler with shaved ice; pour in the claret; shake well.

Gin Punch.—1. To half a pint of old Holland gin add 1 gill of maraschino, the juice of 2 lemons, and the yellow rind of 1 previously infused in the gin, 2 gills of simple sirup or 4 oz. of pulverized sugar, and 1 qt. of seltzer water. Mix well and freeze to a semi-solid.

2. Yellow peel and juice of 1 lemon; gin, ¾ pt.; water, 1¼ pt.; sherry, 1 glass.

Iced.—Champagne or Rhenish wine, 1 qt.; arrack, 1 pt.; juice and yellow peels of 6 lemons; white sugar, 1 lb.; soda water, 1 or 2 bottles; ice as cream.

Milk Punch.—1. Take 1 tablespoonful sugar; 2 tablespoonfuls water; 1 wineglass brandy; ½ wineglass Santa Cruz rum; ½ tumbler shaved ice. Fill with milk and shake well; grate a little nutmeg on top.

2. Yellow rinds of 2 dozen lemons; steep for two days in rum or brandy, 2 qt.; then add spirit, 3 qt. more; hot water, 3 qt.; lemon juice, 1 qt.; loaf sugar, 4 lb.; 2 nutmegs, grated; boiling milk, 2 qt.; mix, and in two hours strain through a jelly bag.

Norfolk.—French brandy, 20 qt.; yellow peels of 30 oranges and 30 lemons; infuse for twelve hours; add 30 qt. of cold water, 15 lb. lump sugar, and the juice of the oranges and lemons; mix well, strain through a hair sieve, add new milk, 2 qt., and in six weeks bottle. Keeps well.

Orange.—As No. 1, using oranges, and adding a little orange wine. A little curaçoa, noyeau, or maraschino improves it.

Princes'.—Put into a freezing can a bottle of sparkling champagne, a gill of maraschino, ½ pt. of strawberry sirup, the juice of 6 oranges, the yellow rind of 1 rubbed on sugar.

Raspberry.—As Norfolk, but using raspberry juice or vinegar for oranges or lemons.

Regent's.—1. Pare off the thin yellow rinds from 4 oranges and 4 lemons; express the juice from the same fruit and strain it; add to it the yellow rinds, with 2 sticks of cinnamon broken up, ½ doz. cloves, and a dessertspoonful of vanilla sugar. Simmer these ingredients very slowly for half an hour in 1 qt. of simple sirup. Express the juice from 1½ doz. of lemons, and add it to the decoction. Then make a strong infusion of the finest green tea and add it to the mixture; after which add equal portions of old Jamaica rum and Cognac brandy, according to the strength required. Mix all well together, strain through a hair sieve, put it into a freezer and make very cold.

2. Strong hot green tea, lemon juice, and capillaire, of each 1½ pt.; rum, brandy, arrack, and curaçoa, of each 1 pt.; champagne, 1 bottle; mix, and slice a pineapple into it.

Tea.—Hot tea, 1 qt.; arrack, ½ bottle; white sugar, 6 oz.; juice of 8 lemons; yellow rinds of 4 lemons.

Wine.—Sugar, 1 lb.; yellow peel of 3 lemons; juice of 9 lemons; arrack, 1 pt.; port or sherry wine (hot), 1 gal.; cinnamon, ¼ oz.; nutmeg, 1 drm.

Whisky.—To 1 wineglass of whisky add 2 wineglasses of hot water, and then sugar to taste. Dissolve the sugar well with 1 wineglass of the water, then pour in the whisky, and add the balance of the water; sweeten to taste, and put in a small piece of lemon rind or a thin slice of lemon.

Purge.—Calomel, 15 grn.; jalap, 15 grn.; mix in some sirup. Great care should be used in taking doses of this.

Purl.—*Prep.* To warm ale or beer, add bitters, 1 wineglassful, or q. s. Some add spirit.

Purple of Cassius.—*Syn.* Purple precipitate, cassius do., gold purple, crystallized protochloride of tin, 1 part; crystallized perchloride of tin, 2 parts; dissolve each separately, mix, and add it to a solution of crystallized terchloride of gold, 1 part; wash and dry the precipitate. Very fine.

Puzzolana.—A volcanic ash found at Pompeii, Vesuvius, etc. Mixed with lime it forms an excellent hydraulic cement. A good artificial puzzolana may be made by heating a mixture of 3 bushels of clay and 1 bushel of slaked lime, for some hours, to redness.—*M. Bruyere.*

Putty. See **Cements.**

Putty, Jewelers'.—1. Tin putty, an oxide of tin made by levigating the crusts of oxide

that form upon the metal when kept for some time in fusion. It is used for polishing.

2. Melt tin, 1 oz. with an equal weight, or 1½ oz. of lead, and then raise the heat so as to render the mixed metal red hot, when the tin will be immediately flung out in the state of putty. Both are very hard, used for *polishing* glass and japan work, and to color opaque white enamel.

Putty, to Soften and Remove. See **Cleansing.**

Putty Powder.—Tin peroxide, used for polishing. See **Jewelers' Putty** above.

Putz Powder. See **Polishing.**

Pyro Developer. See **Photography.**

Pyrophorus.—Term given to substances which inflame instantly when exposed to the air. The following are some of the compositions:

1. Lampblack, 3 parts; burnt alum, 4 parts; potassium carbonate, 8 parts. Then place in a ladle and heat until dry. Then place in a test tube and heat until the flame ceases to be emitted. Then place a stopper in the test tube and cool.

2. Potassium sulphate, 9 parts; lampblack calcined, 5 parts. Proceed as before.

Pyrotechny. — *Asteroid Rocket.* — Composition for 1 lb.: Niter, 8 oz.; fine charcoal, 3½ oz.; No. 2 charcoal, ½ oz.; sulphur, 2 oz.; meal powder, 1½ oz.

Bursting Powder.

Number	1	2	3
Meal powder	1	1	8
Grain powder F	—	1	—
Charcoal	—	—	1

Chlorate Meal Powder.

Number	1	2	3
Chlorate of potash	25	15	60
Charcoal, fine	5	3	9
Sulphur	3	2	8

To Represent Cordage in Fireworks.—Antimony, 1 part; juniper resin, 1 part; niter, 2 parts; sulphur, 16 parts. Mix and soak soft ropes with the composition.

Common and Sparkling Fires.—1. Meal powder, 4 parts; charcoal, 1 part.

2. Meal powder, 16 parts; niter, 8 parts; sulphur, 4 parts; charcoal, 4 parts.

3. Meal powder, 16 parts; very fine glass dust, 5 parts.

4. Meal powder, 8 parts; very finely powdered porcelain, 3 parts. These fires can be arranged very effectively as stars, suns, etc. For instance, provide a circular disk of hard wood, 6 in. in diameter and 1 in. thick. Nail to this 5 spokes of wood at equal distances from one another, and 15 in. long. Nail also to the back of the central disk a strip of wood about 2 feet long, 2 inches wide, and ¾ inch thick. By means of this you can screw the whole piece conveniently to your firing post. On each of the 5 spokes tie a case of brilliant fire, supported at its end, and connect the mouths of these with quick match.

Red Chinese Fire.—1. Meal powder, 16 parts; niter, 16 parts; sulphur, 4 parts; charcoal 4 parts; iron borings, 14 parts.

2. Meal powder, 16 parts; sulphur, 3 parts; charcoal, 3 parts: iron borings, 7 parts.

3. Meal powder, 8 parts; niter, 16 parts; sulphur, 3 parts; charcoal; 3 parts; iron borings, 8 parts.

4. Meal powder, 16 parts; niter, 8 parts; sulphur, 4 parts; charcoal, 3 parts; Iron borings, 7 parts.

On Preparing Some Colored Fires (Bengal Lights) Used in Pyrotechny.—By Sergius Kern (St. Petersburg). — In preparing colored fires for fireworks by means of the usual formulæ given in many manuals of pyrotechny, it is often very necessary to know the quickness of burning of colored fires, as in some cases, as decorations and lances, they must burn slowly; in other cases, as wheels, stars for rockets, and Roman candles, they must burn quicker. Working for some months with many compositions of such kind, I prepared three tables of colored fires (red, green and violet), where every formula with a higher number burns quicker than a fire with a lower number. For instance. No. 5 burns quicker than No. 6 and slower than No. 4. These tables will, I think, be of much assistance in the preparation of fireworks.

Green Colored Fires.—

No.	Potassium Chlorate. Per cent.	Barium Nitrate. Per cent.	Sulphur. Per cent.
1	36	40	24
2	29	48	23
3	24	53	23
4	21	57	22
5	18	60	22
6	16	62	22
7	14	64	22
8	13	66	21
9	12	67	21
10	11	68	21
11	10	69	21
12	9·5	69·5	21
13	9	70	21
14	8·5	70·5	21
15	8	71	21

Red Colored Fires.—

No:	Potassium Chlorate. Per cent	Strontium Nitrate. Per cent.	Sulphur Per cent.	Carbon Powder. Per cent.
1	40	39	18	3
2	32	46	19	2
3	27	51	20	2
4	23	55	20	2
5	20	58	20·5	1·5
6	18	60	21	1
7	16	61 6	21·2	1·2
8	15	63	21	1
9	13	64	22	1
10	12	65	22	1
11	11	66	22	1
12	10	67	22	1
13	10	67 25	22	0·75
14	9·25	68	22	0·75
15	9	68·35	22	0·65

Violet Colored Fires.—

No.	Potassium Chlorate. Per cent.	Calcium Carbonate. Per cent.	Malachite powdered. Per cent	Sulphur. Per cent.
1	52	29	4	15
2	52	28	5	15
3	52	26	7	15
4	52	24	9	15
5	52	23	10	15
6	52	21	13	15
7	51	20	14	15
8	51	18	16	15
9	51	16	18	15
10	51	15	19	15
11	51	13	21	15
12	51	11	23	15
13	51	10	24	15
14	51	8	26	15
15	51	6	28	15

—*Chemical News.*

Colored Fires for Theaters.—We give below a table of the composition of the mixtures commonly employed for colored fires in tableaux, etc. These fires, however, should never be used within doors, as the gaseous products of some of them are extremely poisonous. The lime light lanterns and lenses of suitably col-

ored glass have now been generally substituted for these fires, and give much better results.

	1 Green	2 Red	3 Yellow	4 Blue	5 White
Chlorate of potash	32·7	29·7		54·5	
Sulphur	9·8	17·2	23·6		20
Charcoal	5·2	1·7	3·8	18·1	
Nitrate of baryta	52·3				
Nitrate of strontia		45·7			
Nitrate of soda			9·8		
Ammonium sulphate of copper				27·4	
Saltpeter			62·8		60
Black sulphide of antimony		5·7			5
Floury gunpowder					15

It is hardly necessary to mention that great care is required in mixing these materials, and that each should be pulverized separately.

Fires or Lights, Colored.—These fires serve to illuminate; hence intensity of light with as little smoke as possible is aimed at. In the preparation of such mixtures the ingredients, which should be perfectly dry, must be reduced separately, by grinding in mortar or otherwise to very fine powders, and then thoroughly but carefully mixed together on sheets of paper with the hands or by means of cardboard or horn spatulas. The mixtures are best packed in capsules or tubes about 1 in. in diameter and from 6 to 12 in. long, made of stiff writing paper. Greater regularity in burning is secured by moistening the mixtures with a little whisky and packing them firmly down in the cases by means of a wooden cylinder, then drying. To facilitate ignition a small quantity of a powder composed of mealed powder, 16 parts; niter, 2 parts; sulphur, 1 part, and charcoal, 1 part, loosely twisted in thin paper, is inserted in the top. The tubes are best tied to sticks fastened in the ground.

White Lights.—

Saltpeter	4	oz.
Sulphur	1	oz.
Black sulphide of antimony	1	oz.

Yellow Lights.—

1. Chlorate of potash	4	oz.
Sulphide of antimony	2	oz.
Sulphur	2	oz.
Oxalate of soda	1	oz.
2. Saltpeter	140	oz.
Sulphur	45	oz.
Oxalate of soda	30	oz.
Lampblack	1	oz.

Green Lights.—

1. Chlorate of baryta	2	oz.
Nitrate of baryta	3	oz.
Sulphur	1	oz.
2. Chlorate of potash	20	oz.
Nitrate of baryta	21	oz.
Sulphur	11	oz.

Red Lights.—

Nitrate of strontia	25	oz.
Chlorate of potash	15	oz.
Sulphur	13	oz.
Black sulphide of antimony	4	oz.
Mastic	1	oz.

Pink Lights.—

Chlorate of potash	12	oz.
Saltpeter	5	oz.
Milk sugar	4	oz.
Lycopodium	1	oz.
Oxalate of strontia	1	oz.

Blue Lights.—

Chlorate of potash	3	oz.
Sulphur	1	oz.
Ammonio-sulphate of copper	1	oz.

For colored fires, where the mixtures are ignited in shallow pans and maintained by additions of the powders, the compositions are somewhat different.

White Fire.—

Niter	16	oz.
Mealed powder	4	oz.
Sulphur	8	oz.

Yellow Fire.—

Niter	2	oz.
Sulphur	4	oz.
Nitrate of soda	20	oz.
Lampblack	1	oz.

Red Fire.—

Niter	5	oz.
Sulphur	6	oz.
Nitrate of strontia	20	oz.
Lampblack	1	oz.

Blue Fire.—

Niter	8	oz.
Sulphur	2	oz.
Sulphate of copper	4	oz.

Green Fire.—

Niter	24	oz.
Sulphur	16	oz.
Nitrate of baryta	48	oz.
Lampblack	1	oz.

Bengal Fire.—

Sulphur	4	oz.
Mealed powder	4	oz.
Antimony	2	oz.
Lampblack	16	oz.

From the *Western Druggist:*

Red Fire.—

Strontium nitrate	3	parts.
Potassium chlorate	1	part.
Shellac, in coarse powder	1	part.

Mix.

Green Fire.—

Barium nitrate	3	parts.
Potassium chlorate	1	part.
Shellac	1	part.

Mix.

Violet Fire.—

Calcium carbonate	2	parts.
Malachite	2	parts.
Sulphur	2	parts.
Potassium chlorate	6	parts.

Mix.

Purple Fire.—

Copper sulphide	1	part.
Strontium nitrate	14	parts.
Calomel	14	parts.
Potassium chlorate	15	parts.
Shellac	5	parts.

Mix.

On account of the calomel, this must not be burned indoors.

Yellow Fire.—

Sodium nitrate	3	parts.
Potassium chlorate	1	part.
Shellac	1	part.

Mix.

Blue Fire.—

Copper ammonia sulphate	3	parts.
Potassium chlorate	1	part.
Shellac	1	part.

Mix.

Five-Pointed Star.

Number.	1	2
Meal powder	3	—
Sulphur	8	2
Niter	12	5
Sulphide of antimony	1	1

Spur Fire, for Flower Pots and Star Candles.

Number.	1	2	3	4	5	6	7
Vegetable black	7	2	3	4	2	4	3
Sulphur	14	5	4	16	6	9	7
Realgar, or sulphide of arsenic	2	1	1	2	1	1	1
Niter	32	16	10	32	11	20	15
Meal powder	—	3	—	17	4	5	4
Charcoal	—	—	—	4	1	1	1

Flower Pots, Composition for.—Niter, 18 parts; sulphur, 8 parts; lampblack, 6 parts.

Gerbe.

Number	1	2	3	4	5	6	7	8	9	10	11	12
Sulphur	2	3	—	1	—	2	3	2	2	2	—	—
Niter	2	2	—	—	—	10	6	4	9	4	—	—
Meal powder	16	36	4	8	16	—	9	16	2	2	8	3
Steel filings	1	6	—	—	—	—	—	—	—	—	—	—
Cast iron borings	5	8	1	3	8	7	5	8	5	3	—	—
Charcoal	—	—	—	—	1	2	2	1	2	2	—	—
Coke grains	—	—	—	—	—	—	—	—	—	—	1	—
Porcelain grains	—	—	—	—	—	—	—	—	—	—	—	1

The Mixture for Golden Rain is Composed of.—

Niter	16 oz.
Sulphur	11 oz.
Mealed powder	4 oz.
Lampblack	3 oz.
Flowers of zinc	1 oz.
Gum arabic	1 oz.

All the materials used in fireworks must be in the state of fine powders and perfectly dry.

Gunpowder.—The component parts of gunpowder are saltpeter, sulphur, and charcoal, used in the following proportions:

1. English war powder.—Saltpeter, 75 parts; sulphur, 10 parts; charcoal, 15 parts.

2. French war powder.—Saltpeter, 75 parts; sulphur, 12·5 parts; charcoal, 12·5 parts.

3. French sporting powder.—Saltpeter, 76·9 parts; sulphur, 9·6 parts; charcoal, 13·5 parts.

4. French blasting powder.—Saltpeter, 62 parts; sulphur, 20 parts; charcoal, 18 parts.

There are a number of variations of the above receipts, but the difference, which is purely a matter of opinion, consists principally in varying the quantity of sulphur or charcoal employed. See **Powders.**

Inflamant.

Number	1	2	3
Charcoal	1	1	1
Meal powder	8	16	24
F. F. F. grain	4	8	12

Lances.—1. Lances are small paper cases, two to four in. in diameter, filled with composition, and are used to mark the outlines of figures. They are attached endwise to light wooden frames or sticks of bamboo and connected by streamers or quick match. The following are some of the compositions used in these:

	White	Yellow	Red	Blue	Green
Niter	26	—	16	8	96
Sulphur	9	4	10	2	64
Mealed powder	5	4	7½	—	—
Nitrate of soda	—	16	—	—	—
Lampblack	—	2	—	—	8
Nitrate of strontia	—	—	30	—	—
Sulphate of copper	—	—	—	4	—
Nitrate of baryta	—	—	—	—	192

2. Lances are used in making up devices, such as names, mottoes, wreaths, and so on. They consist of small cases, generally made about ⅛ of an inch in diameter, that is, round a piece of glass or brass rod or tube of that size; tubes are always best for these small formers. The cases are about 2 or 2½ in. long, with one end pinched or turned in. Two rounds of thin demy or double crown white paper, pasted, will give sufficient thickness and substance for the case. The cases, when dry, are to be filled with either of the compositions in the same way as golden rain:

Compositions for Lances. White.—1. Niter, 16 parts; sulphur, 8 parts; meal powder, 6 parts.

2. Niter, 16 parts; sulphur, 4 parts; meal pow- 6 parts.

3. Niter, 12 parts; sulphur, 4 parts; sulphide of antimony, 3 parts.

4. Niter, 72 parts; sulphur, 18 parts; regulus of antimony, 33 parts; realgar, 1 part; shellac, 1 part.

5. Niter, 96 parts; sulphur, 24 parts; regulus of antimony, 48 parts; realgar, 6 parts; shellac, 1 part. These for the most part give a bluish white flame, and when employed in cases of the size mentioned above, burn slowly, and will last as long as this species of firework is required to last.

Yellow.—1. Chloride of potash, 72 parts; oxal. soda, 60 parts; stearine, 6 parts; sulphur, 6 parts.

Pin Wheels.

Number	1	2	3	4	5	6	7	8	9	10	11	12	13
Sulphur	1	3	5	3	7	14	4	4	2	2	3	2	—
Niter	1	4	9	5	9	16	8	4	5	2	3	2	—
Meal powder	2	9	15	8	20	32	26	16	36	26	35	18	3
Sulphuret of Antimony	—	—	—	—	1	3	1	—	—	—	—	—	—
Beech sawdust, fine	—	—	—	—	—	—	1	—	—	—	—	—	—
Oxalic acid	—	—	—	—	—	—	—	3	—	—	—	—	—
Litharge, fine	—	—	—	—	—	—	—	—	2	—	—	—	—
Orpiment, or realgar	—	—	—	—	—	—	—	—	—	2	3	—	—
Vegetable black	—	—	—	—	—	—	—	—	—	1	2	—	—
Nitrate of lead	—	—	—	—	—	—	—	—	—	—	—	3	1

Compositions for Pin Wheels, etc.—

	Common.	Brilliant.	Chinese.	White.
Niter	6	1	1	6
Sulphur	1	1	1	7
Mealed powder	16	16	7	16
Charcoal	6	—	—	—
Steel filings	—	7	—	—
Cast iron filings	—	—	7	—

Port Fire.

Number	1	2	3	4
Meal powder	3	1	1	5
Sulphur	4	2	2	8
Niter	12	4	6	25

Quick Match.—Make a thick paste of gunpowder and hot water, with a small quantity of gum in it. Take about four strands of cot-

ton, such as is sold in balls and used for making the wicks of lamps, steep this in the solution of niter used for making touch paper, and wring it as dry as possible; then rub it well in the gunpowder paste till it is thoroughly covered with it. One end of the cotton may be passed through a small funnel, whose mouth is not more than ⅛ in. in width. By this means, if the whole length of the cotton is drawn through it, the superfluous paste will be removed, and the match will be of a nice round form. Hang it out of doors on a dry day, and when it is nearly dry coil it upon a tray or paper, and dust it over with meal powder. In winter it will not be sufficiently dry for use under a week. When thoroughly dry it should be stiff and hard, and the less it is bent or doubled the better. To use this match for connecting the mouths of different fireworks, or clothing them, as it is termed, make some long paper tubes round a wire former which has a diameter of not less than $\frac{3}{16}$ in. These pipes are threaded on the match, and have a piece cut away at their sides wherever they are inserted into the mouth of a case, in order that the match may be laid bare and convey its fire to the priming of the cases.

Silver Rain.

Number	1	2	3	4
Steel filings	1	2	2	3
Meal powder	4	7	8	—
Niter	—	1	—	2
Sulphur	—	—	1	—
Charcoal	—	—	—	3
Nitrate of lead	—	—	—	10

Gold Rain.

Number	1	2	3	4	5
Sulphur	1	1	1	—	—
Niter	2	2	2	—	—
Charcoal	6	1	5	1	3
Meal powder	16	6	18	4	8

Rockets.

Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Sulphur	1	1	12	4	8	4	2	4	2	2	1	1	8	1	1	1	2	—
Charcoal	4	2	17	5	11	7	4	8	12	8	2	2	27	2	2	4	4	1
Niter	8	5	50	16	32	16	9	16	20	16	4	4	36	4	4	8	8	—
Meal powder	—	—	—	—	—	—	—	3	1	1	1	2	6	2	1	1	1	4
Steel filings	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	2	—	—

Rockets, ½-lb.—Composition for.—1. Niter, 9 oz.; sulphur, 2 oz.; meal powder, 1½ oz.; fine charcoal, 2 oz.; No. 2 charcoal, 2 oz.

2. Niter, 8 oz.; sulphur, 2 oz.; meal powder, 1½ oz.; fine charcoal, 4 oz.

3. Niter, 8 oz.; sulphur, 1½ oz.; fine charcoal, 3 oz.; No. 2 charcoal, 1½ oz.

Rockets, ¼-lb.—Composition for.—1. Niter, 8 oz.; sulphur, 1½ oz.; meal powder, 2 oz.; fine charcoal, 2½ oz.; No. 2. charcoal, 1½ oz.

2. Niter, 8 oz.; sulphur, 1½ oz.; meal powder, 2½ oz.; fine charcoal, 2 oz.; No. 2 charcoal, 2 oz.

3. Fine fire.—Niter, 8 oz.; sulphur, 2 oz.; meal powder, 2½ oz.; fine charcoal, 4 oz.

Roman Candle.

Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Sulphur	4	2	3	1	1	2	7	3	4	6	8	3	8	—
Charcoal	3	3	3	2	1	3	8	1	1	7	9	3	11	2
Niter	8	2	8	4	3	9	21	4	5	18	18	10	32	1
Meal p'wder	8	8	3	3	2	4	12	5	4	4	4	7	—	3

Roman Candles.—To Make a ⅝ Roman Candle.—Procure a straight piece of brass tube, ⅝ of an inch external diameter and 16½ inches long. Saw or file off a piece, 1½ inch long, Fig. 1. This is for the star former, and is drawn of the correct size.

In the other piece, of 15 inches, fix a handle, as shown, in diminutive, in Fig. 7. This is for the case former. It should be filed smooth at the end.

Take another piece of brass tube, $\frac{9}{16}$ of an inch external diameter and about 16½ inches long. In this also fix a handle, or fix it into a handle, Fig. 4. Invert it, and set it upright in a flower pot, filled with sand or loose mould. Melt some lead in a ladle, and pour it slowly into the tube, leaving room for the air to escape up the side, till it is full. If the lead is poured in rapidly, the confined air, expanding, jerks the metal up, and may cause serious injury. A pound or more of lead will be required. When cold, drive the end of the lead in with a hammer, and file in smooth. This is for a rammer.

Take a piece of deal, Fig. 6, about 12 inches long, 6 inches broad, and ¾ inch thick; and, on the top, screw a handle, like one on a scrubing brush. This is for a rolling board. An iron door handle would answer. A wooden one, however, about an inch thick, not cylindrical, but slightly flat, and rounded at the edges, is preferable, as it gives more purchase for the hand.

Cut a piece of tin, or zinc, or thin board into the shape of figure 8, in which the distance between the arms, *a* and *b*, across the dotted line, shall be ⅞ of an inch. This is for a gauge, with which to measure the external diameter of the case. Write upon it, ⅞ space.

Procure some 60 lb., 70 lb. or 84 lb. imperial brown paper; the size of a sheet will be 29 in. by 22½. Cut a sheet into four equal parts, each 14½ by 11¼; paste the four pieces on one side, and lay them on one another, with the pasted face upward, putting the fourth piece with the pasted side downward, upon the pasted side of the third piece. Turn them over; take off the now top piece, and lay it flat on the near edge of a table, pasted side upward. Take the former, Fig. 7, and paste the tube all over. Lay it along the edge of the paper, bend the paper over with the fingers of both hands, and roll it tightly up, until the external diameter of the case about fits the guage, Fig. 8. If the paper should be too long, of course a piece must be cut off; if it should not be long enough, more must be added, taking care to bind in the second piece with three or four inches of the first piece; for if the whole of the first piece be rolled up before beginning the second, the latter, when dry, will probably slip off and spoil the case. The case having been rolled up, take the handle of the former in the left hand, lay the case flat on the near side of the table, take the rolling board, Fig. 6, in the right hand, press the front part of it on the case, and drive it forward five or six times, like a jack plane, letting the handle of the former slip round in the left hand. This will tighten the case, and render it, when dry, as hard as a book cover.

The former must always be pasted before rolling a case, to prevent its sticking. It

should, likewise, be wiped clean with a damp sponge before being laid aside. Brass tubes keep clean a much longer time if lacquered. To lacquer them, clean them with very fine glass paper; make them hot by the fire, till you can just bear them on the back of the hand; then, with a camel's hair pencil, wash them over with thin lac solution. The cases may be either 1½ or 1¼ in. long; but 1¼ is the best, for when the cases are too long, the fuse, as it approaches the bottom, is apt, if slow, to smoke; if fierce, to set the top of the case in a flame. If the learner decides upon 1¼ in., the former and rammer may each be two or three inches shorter.

After the first case has been rolled up to fit the gauge, it may be unrolled and the paper measured. Future pieces of the same quire of paper can then be cut of the right size at once, so that the case will fit the gauge without further trouble.

A large slab of slate is convenient for rolling upon, but a smoothly planed board will answer every purpose.

When a number of cases are finished hitch a piece of flax two or three times round each of them, and hang them up to dry in a place free from draught, that they may not warp.

Flax is sold in balls; the thick yellow is the best. It is named indifferently, flax or hemp. It is much used by shoemakers and is sold at the leather shops. Two or three thicknesses of this, waxed, or drawn through the hand with a little paste, is very convenient for passing round the necks of small choked cases, tying cases on wheels, etc.

To Make a Roman Candle Star.—Take the former, Fig. 1, which, as said before, is 1½ in. long; have a cylindrical piece of turned wood, box, beech or mahogany, Fig. 2, about 2 in. long, and of a diameter to just fit easily into Fig. 1. At a point, *a*, at the distance of about ⅞ of an inch from the end, *d*, with a bradawl or very small gimlet or nosebit, make a hole and drive in a piece of brass wire, to project just so much as to prevent the tube slipping over it. A piece of a brass rivet, such as used by shoemakers, is convenient for the purpose. The part with the head on is best; a quarter of an inch length will be sufficient, filed or cut off with the nippers. It is evident that upon inserting Fig. 2 into the tube, Fig. 1, a vacant space of ⅝ of an inch will be left at the bottom. Fig. 3 is a piece of turned wood, or better still, of turned brass, exactly like Fig. 2, without the side pin, *a*. Now, to pump a star, insert Fig. 2 in Fig. 1; press the tube into damped composition, turn it round and withdraw it. Rest the tube on a flat surface, insert Fig. 3 and give it two or three taps with a small mallet, like Fig. 26. A convenient size for the mallet is 1½ in. square, 3 in. long, with a turned handle. The mallet is best made of beech or mahogany. The slight malleting consolidates the star and prevents it from getting broken in charging; it will compress it to about nine-sixteenths of an inch in height. Push it out and set it by to dry.

Stars are best made in summer, and dried in the sunshine; when dry they should be put into clean pickle bottles furnished with tight fitting bungs. A piece of wash leather passed over the bottom of the bung, gathered up round the sides, and tied at the top like a choke, makes a good stopper. Shot shaken up in bottles, with water, soon cleans them.

To Damp Stars.—Stars containing nitrate of strontium must be damped either with lac solution or wax solution; anything containing water destroys the color. Niter stars may be damped with gum water, dextrine solution or thin starch. Most other stars with either of the solutions. Crimsons and greens will mix with boiled linseed oil, but they cannot then be matched, as oil renders meal powder almost imflammable. With all stars, not a drop more of the solution should be used than is sufficient to make the composition bind; and it is advisable not to damp more than half an ounce at a time; this is particularly the case in using the lac solution, as it dries rapidly; and if a large quantity of composition is damped and gets dry and has to be damped over and over again, it becomes clogged with the shellac and the color is deteriorated. If it should get dry, and require a second damping, it is best to use pure alcohol only the second time.

Before mixing compositions, every article should be as fine as wheaten flour and perfectly dry. Nitrate of strontium, if purchased in the lump, should be set over the fire in a pipkin; it will soon begin to boil in its water of crystallization; it must be kept stirred with a piece of wood till the water is evaporated and a fine dry powder left. A pound of crystals will yield about eleven ounces of dry powder, which should be immediately bottled. Even then, if used in damp weather, it is best dried again and mixed with the other ingredients while warm. This second drying may be in a six inch circular frying pan.

Articles, separately, may be reduced to powder with the pestle in a mortar. See that it is wiped clean every time, as there is danger of ignition with chlorates and sulphides. When the articles are to be mixed, they may be put into the mortar and stirred together with a small sash tool. A ⅜ in. is a convenient size. The mixture must then be put into a sieve and shaken in the usual way; or it may be brushed through with the sash tool. Return it to the sieve and brush and shake through again. As it lies in a heap, level or smooth it with the blade of a table knife, or any straight edge: if thoroughly mixed, it will present a uniform color; if it appears darker in one part than in another, it must be sifted again. A sieve with a top and receiver is very desirable, as nearly all mixtures are either black or poisonous; the dust from star mixtures is very injurious to the lungs. If a top and receiver cannot be readily purchased, both may easily be constructed out of a sheet of millboard, fastened with a bradawl and waxed yellow flax, and neatly covered with paper.

Mixtures may be damped on a Dutch tile, a marble slab, or a slate without a frame. They may be stirred about with a dessert knife, pressed flat, and chopped, or minced, as it were, and again pressed flat.

To Make Lac Solution.—Put half an ounce of flake shellac into a tin pot, and pour upon it ¼ of a pt. or 5 oz. of methylated spirit; or preferably, a like quantity of wood naphtha. Let it stand for about a day, stirring it occasionally till dissolved. Then half fill a basin with boiling water, set the tin containing the lac in it and leave it till it boils and curdles. If the water does not remain hot long enough to make it boil, set it in a second basin of boiling water. As soon as it has curdled remove it, and when cold pour it into a vial and cork it. Spirit must never be boiled over a fire nor near one, as the vapor might inflame. Keep the pot, therefor, while in the hot water, at a distance from a fire or flame of a lamp or candle.

To Make Wax Solution.—Put into a vial ½ an oz. of white (bleached beeswax), pour upon it 5 oz. of mineral naphtha (coal or gas tar naphtha); keep it tightly corked.

To Make Stearine Solution.—Dissolve a piece of composite candle in mineral naphtha in the same way. Mineral naphtha must not be used near a candle or fire, as it gives off an inflammable vapor at less than 100° Fahrenheit.

To Make Gum Solution.—There is no better way of preparing this than simply to put cold water upon gum arabic, and let it stand till dissolved. If for sticking purposes, as much water as will just cover the gum will be sufficient; but, for making quick match, 1 oz. or 1¼ oz. of gum to a pint of water. If required

in a hurry, put the gum into cold water, in a pipkin or tin saucepan, set it on the fire, make it boil, and keep stirring till dissolved. When cold, bottle and cork it.

To Make Dextrine Solution.—Take ½ an oz. of dextrine and 5 oz. or a ¼ pt. of cold water, put the dextrine into a cup or basin, add a little of the water, and mix it well with a teaspoon, rubbing it till all is dissolved; then add the remainder of the water, stir well together a second time, pour it into a vial and cork for use. Dextrine, wetted to the consistency of honey, may be used instead of thick gum arabic water for pasting. For this purpose it is advisable to keep either in a wide mouthed bottle, and to set the bottle in a gallipot containing a little water; the brush, a camel's hair pencil, or very small sash tool with one-third of the bristles cut away on each side, to render it flat, can then be kept in the water when not in use; this will prevent it, on the one hand, from becoming dry and hard; and, on the other, from getting clogged and swollen. It can be squeezed between the thumb and fingers when wanted for use. The flat gum brushes now sold, bound with tin, are not pleasant to use, as the tin oxidizes and turns of a disagreeable brown color. If there is a difficulty in obtaining a graduated water measure, one sufficiently correct for pyrotechnic purposes may be made with a vial. Paste a narrow strip of paper up the outside of the vial, weigh 4 oz. of water in a cup in the scales; pour it into the vial, mark the height, and divide it into four equal parts for ounces; of course, it can be graduated into half and quarter ounces, and increased, if large enough, to five or more ounces. A gallon of distilled water weighs exactly ten pounds. Consequently a pint of pure water weighs a pound and a quarter. This is also near enough for spirit, though, of course, spirit is a trifle lighter. Doctors' vials are often marked with ounce divisions.

To Make Paste.—Paste is most economically made in a zinc pot, which may be 4 in. deep and 3½ in. diameter. Any zinc worker will make one to order. Put into it 2 oz. wheaten flour, add a little cold water, rub the two together with a spoon till smooth and free from lumps; pour in more water till the pot is full within about an inch, set the pot in half a saucepanful of water, put it on the fire; make the water boil, and keep it and the paste boiling for four or five minutes, stirring the paste the while. Remove it from the fire, and set it by to cool. The paste is to remain in the zinc pot, in which it will keep good for a length of time and beautifully white.

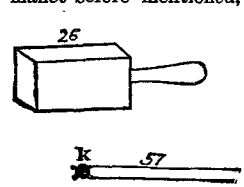
Some recommend alum in paste; but it is best avoided, especially in cases intended to receive colored fires. Alum is a double salt, a sulphate of alumina and potassa; it has an acid reaction; and, coming in contact with chlorate of potash and sulphur, may cause spontaneous combustion. A drop of sulphuric acid instantly ignites stars containing them. At theaters the clown sometimes fires a cannon with what appears to be a red hot poker, but which in reality is only a piece of wood painted red. A mixture is made of chlorate of potash and sulphur or sugar, a glass bead is filled with sulphuric acid, and the hole stopped up with wax. This is laid in the mixture, and when it is struck with the poker, the liquor escapes and inflames the potash and sulphur. Sulphate of copper is a particularly dangerous salt, and must never be used, as it is almost certain to cause spontaneous combustion. Chertier, to whom pyrotechny otherwise owes so much, introduced an empirical preparation, by dissolving sulphate of copper in water, together with chlorate of potash, drying it, and wetting it with ammonia; but this, however dried, when again wetted, turns litmus paper red. Practicus has named it Chertier's copper. Its use is not recommended.

Two paste brushes will be sufficient for an amateur, sash tools, one about an inch diameter, the other smaller for light purposes. Let them stand in the paste. If they get dry, the bristles fall out. For convenience, one may be kept in the paste and one in water.

Dry clay, powdered and sifted as fine as possible, is used for plugging or stopping up the bottoms of cases. Amateurs have discontinued its use, and employ plaster of Paris in preference. Directions will be given for each, so that the learner can adopt which he pleases; but plaster is infinitely preferable. It is an American improvement.

Roman Candle Scoops.—No species of fireworks require greater care in their construction than Roman candles. In the first place the stars must be fierce, that they may light thoroughly; next, they must not be driven out with too great velocity. For this purpose the blowing powder must be carefully adjusted. The stars also must be of so easy a fit that when put into the case they may fall to the proper depth of their own accord. If they require pushing, they are too tight, and will probably be blown out blind. When made as directed they will necessarily be of an easy fit, as they will be of the inner diameter of the brass tube, while the bore of the case is equal to its external diameter.

To regulate the blowing powder, prepare a number of little scoops, like Fig. 5, which is about the right size for the bottom star. They are formed of pieces of tin, zinc, or copper. Cut a long strip of tin ½ in. broad; cut this across into 7 pieces of the following lengths: 1⅝, 1¾, 1⅞, 2, 2⅛, 2¼, and 4 in. Round off the corners. Take a piece of brass wire, or stair rod about ¼ in. in diameter, and with the wooden mallet before mentioned, Fig. 26, bend each

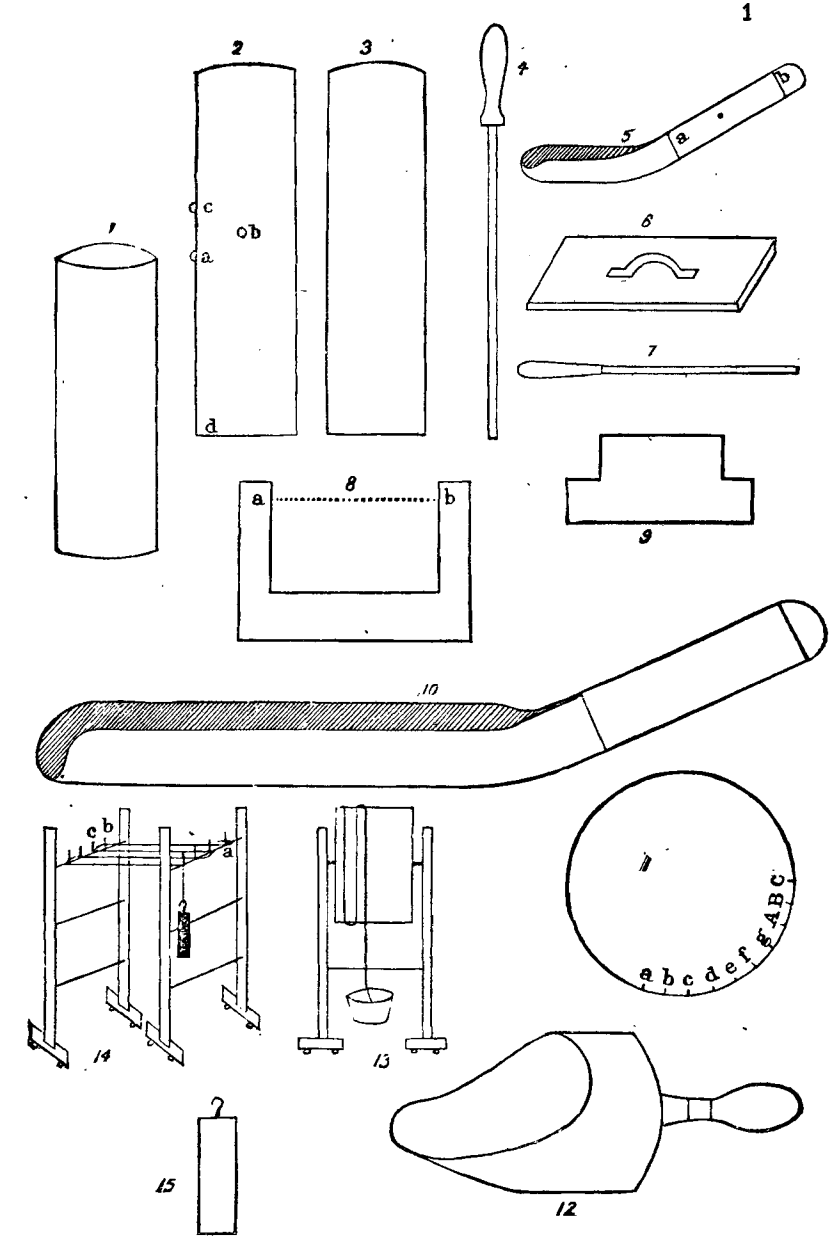


of the pieces round the rod into a half cylinder or gutter. Take up the smallest and hold ⅝ in. of the end of the stair rod in the end of the semi-cylinder to keep it open; put the other part, from *a* to *b*, Fig. 5, in a vise and pinch it up; it will assume the form represented; the bowl part will be ⅝ in. long and the handle 1 in. long. Make the bowl of the next scoop ⅝ in. long, the next ⅞ in., and so on; the handle will always be 1 in. long. The last, for the top star, will have a bowl of 3 in. The smallest scoop ought to hold as much grain powder as will weigh about one twelfth of the star; but to have the scoops accurate, it will be necessary to charge a Roman candle, fire it, and observe whether the stars go a uniform height. For measuring the interval fuse, or fuse between the top of one star and the bottom of the next, a large scoop of the size of Fig. 10 will be required. The tin may be 1 in. broad, and the bowl part 2½ in. long, bent round the rammer, Fig. 4. To adjust it, take a Roman candle case, fit on the foot, Fig. 9, which is a piece of wood or brass turned with a tenon to fit tight at the bottom of the case. Fill the scoop and strike it level with a straight edge; empty it into the case, rest the foot on a flat surface; insert the rammer, Fig. 4, and jolt it up and down a dozen times or more, lift it about ½ in. at a time; put in another scoopful and jolt it in like manner. If the two scoopfuls thus compressed fill 1 in. of the case, the scoop will be correct. If more or less, the scoop must be shortened or lengthened accordingly.

A piece of writing paper may be pasted and

wound twice round the handle of each scoop, as from *a* to *b*, Fig. 4. One dot can be put upon the scoop for the first or bottom star; two dots for the second scoop, etc., or any memorandum can be written upon them for future guidance. Should they get soiled, they may be cleaned with a soaped damp piece of sponge.

Gunpowder for fireworks is used in two forms, meal powder and grain powder. Meal powder is a fine black dust and is employed in all cases of mixing. Grain powder is of three kinds, F, FF, and FFF—fine, double fine and treble fine. FFF is best for crackers, simply because it runs rapidly down the pipes; for driving stars, shells, etc., F will be sufficient,



but FFF may be employed; FF need not be purchased. If in any place there should be a difficulty in obaining meal powder, F grain powder may be crushed in a leather bag by laying the bag on a hard surface and beating it with a hammer. The leather should be of the same kind as shoes are made of.

To Charge Roman Candle Cases.—Pour some F grain powder into a wooden bowl or platter, represented by Fig. 11. Round the edge lay the little blowing powder scoops side by side, beginning with the smallest at *a*, the next at *b*, and so on to *g*. Put some Roman candle fuse into a large tin scoop, made to stand on a flat bottom, like Fig. 12, the same in shape as used by tea dealers; and, on the right hand of it lay the charging fuse scoop, Fig. 10. If the Roman candle is to contain different colored stars, set seven in a row in the order desired. When the cases are intended to be fired in threes or fours, the stars in one may be all blue, in another crimson, in another green, in another white. Fit the foot, Fig. 9, in the bottom of the case, put in a *scoopful of clay*, insert the rammer, Fig. 4, and jolt it till the clay is well composed. The clay should fill half an inch. This being done, invert it, and shake out any little dust that may remain. Put in the little scoopful, *a*, of F grain powder, then lay the scoop at A. Now put in a star. As previously stated, it ought to fall of its own accord; but make sure that it has reached the blowing powder by *putting in the rammer*. Having ascertained this, put in a scoop of fuse, Fig. 10; lay the scoop on the right of Fig. 12; insert the rammer and jolt it; put in another scoop of fuse, Fig. 10; lay the scoop on the right of Fig. 12; insert the rammer and jolt it as before. Then proceed with the scoop, *b*, of grain powder and lay it at B, and so on, till the case is filled. The fuse on the top star is best driven in with a short solid rammer and mallet, as it is difficult to jolt the long rammer in so small a space. The last eighth of an inch, near the mouth of the case, should be fine meal powder, as it binds better than the Roman candle fuse, and also blows off the leader pipe.

The blowing powder scoops, having been laid at A, B, etc., all that is required is to turn the bowl or platter a little round to the left and they will come in rotation ready for the next case. Also, by putting the scoop, Fig. 10, alternately to the left and right of the scoop, Fig. 12, it will always be known whether the proper quantity of fuse has been put in.

Colored stars, from their fierceness, have a tendency to burn in the cases. This defect may be remedied by putting upon each star a small coopful of starting fire, No. 1, before putting in the interval fuse as much as will fill round the sides of the star. This composition is somewhat fiercer than would suit for the regular fuse; so catches the blowing powder sooner.

A Roman candle is well charged when the stars isochronize, or come out at equal intervals of time; they should also, theoretically, ascend to equal heights; but with colored stars this cannot be perfectly insured, as some shrink more than others in drying, and of course fit more loosely; some are heavier, some fiercer than others.

The interval fuse must always be driven in at twice, never at once. Each star, with its blowing powder and fuse, occupies about an inch and a half; perhaps a trifle more.

Instead of driving in clay at the bottom, plaster of Paris may be used, and then the foot, Fig. 9, will not be required. Have some plaster of Paris in a wide-mouthed bottle; a glass of cold water with a salt spoon in it; and a number of pieces of paper about four inches square. Put a small quantity of the plaster on one of the pieces of paper; indent the middle with the finger; put to it a little water and work it up with a dessert knife. Just as it gets to the consistency of mortar and is about to set, mould it with the fingers to the shape of a cork; push it in to the end of the case; rest the case on a flat surface; insert the rammer and give it two or three slight jolts; turn it round a few times and withdraw it. If the plaster sticks to the end of the rammer, it shows either that you have used the plaster too wet or have not turned the rammer round a sufficient number of times.

No more plaster must be mixed at a time than will suffice for one case. When plaster has once set it cannot be mixed up a second time; therefore take a fresh piece of paper and let the knife be cleaned every time. It is advisable to have two dessert knives, then one can be used to scrape the other. As much plaster should be used as will fill the case up about half an inch. They must be set by to dry; their not requiring the use of the foot will be found a great convenience.

Roman candles are usually made from three-eighths to six-eighths, but five-eighths is a very satisfactory size. If a Roman candle is intended to be fired singly, twist a piece of touch paper round the mouth. If the cases are intended to be fired in threes, fours, etc., to form a bouquet, or to be placed round a mine, jack-in-the-box, or devil-among-the-tailors, omit the touchpaper and envelop the case in double crown, made to project an inch beyond the mouth, to receive the leader or quick-match.

A steel pen inserted, nib backward, in the end of a small paper tube, rolled round the end of a pen holder, makes a neat little scoop. It may be fastened in with a little plaster of Paris. A scoop may also be made with a quill.

Composition for Roman Candles.—1. Niter, 18 parts; sulphur, 6 parts; fine charcoal, 7 parts; meal powder, 4 parts.

2. Niter, 16 parts; meal powder, 8 parts; fine charcoal, 8 parts; sulphur, 6 parts.

3. Niter, 16 parts; meal powder, 11 parts; sulphur, 6 parts; antimony, 4 parts. The next thing is to fill the case. Before filling it introduce a little clay to the bottom of the case, thus forming a better and firmer bottom. This being done properly, put in a little coarse powder, and over this a small piece of paper to prevent the composition mixing with the powder; then ram down as much composition as will fill the case one-sixth of its height; over this put a small piece of paper covering about two thirds of the diameter, then a little corn powder, and upon that a ball, observing that the ball is rather smaller than the diameter of the case. Over this first ball more of the composition must be put and rammed lightly down to prevent breaking the ball, till the case is one third full; then a piece of paper, a little powder, and then another ball as before, till the case is filled with balls and composition, taking care to place composition above the highest ball. When the case is thus filled, cap it with touch paper by pasting it round the orifice, and a little priming of powder being added, the work is complete.—*Pyrotechnist's Treasury.*

Saxon.

Number	1	2	3
Sulphur	1	3	5
Niter	1	4	9
Meal powder	2	9	15

Shell Fuse.

Number	1
Meal powder	4
Niter	2
Sulphur	1

Signal Fireworks.—The following proportions are given in an English patent by E. H. Lamarre, of Paris, for colored lights for signals:

White Light.—One hundred parts potassium chlorate, 10 parts antimony sulphide, 15 parts boiled linseed oil.

Red Light.—Fifty parts potassium chlorate, 50 parts strontium nitrate, 5 parts wood charcoal, with as much linseed oil as is required to knead the mass together.

Green Light.—Fifty parts potassium chlorate, 50 parts barium nitrate; 5 parts wood charcoal and linseed oil, as above. The use of linseed oil is claimed as a specialty in substitution for oil of turpentine or resin.—*Science Record*, 1874.

Rose Colored Stars.—Chlorate of potash, 20 parts; carbonate of strontia, 8 parts; calomel, 10 parts; shellac, 2 parts; sulphur, 3 parts; fine charcoal, 1 part. The advantage of this composition is that it is not at all liable to suffer from damp in winter. The carbonate of strontia is a salt not absorbent of moisture like the nitrate, and is, moreover, always to be had in a state of fine powder.

Green Stars.—1. Chlorate of potash, 20 parts; nitrate of baryta, 40 parts; calomel, 10 parts; sulphur, 8 parts; shellac, 3 parts; fine charcoal, 1 part; fused sulphide of copper, 1 part.

2. Nitrate of baryta, 40 parts; realgar, 2 parts; sulphur, 8 parts; lampblack, 1 part.

3. Chlorate of potash, 28 parts; nitrate of baryta, 12 parts; sulphur, 15 parts; mastic, 1 part.

Pale Rose Colored Stars.—Nitrate of strontia, 8 parts; chlorate of potash, 4 parts; sulphur, 3 parts; sulphuret of antimony, 2 parts. Take especial care that the nitrate of strontia used in this formula is very dry.

Pale Green Stars.—Nitrate of baryta, 16 parts; chlorate of potash, 8 parts; sulphur, 6 parts; antimony, 3 parts.

Yellow Stars.—1. Chlorate of potash, 20 parts; bicarbonate of soda, 10 parts; sulphur, 5 parts; mastic, 1 part.

2. Chlorate of potash, 30 parts; dried soda, 12 parts; sulphur, 8 parts.

Golden Yellow Stars.—Chlorate of potash, 20 parts; nitrate of baryta, 30 parts; oxalate of soda, 15 parts; sulphur, 8 parts; shellac, 4 parts. If it is thought advisable to give the stars made from this formula a tailed appearance, add one part of fine charcoal. The composition is to be moistened with the shellac solution. The stars form a beautiful contrast with those of an intense blue.

Blue Stars.—1. Chlorate of potash, 8 parts; sulphide of copper, 6 parts; Chertier's copper, 5 parts; sulphur, 4 parts.

2. Chlorate of potash, 12 parts; Chertier's copper, 6 parts; sulphur, 4 parts; calomel, 1 part.

3. Chlorate of potash, 16 parts; Chertier's copper, 12 parts; calomel, 8 parts; stearine, 2 parts; sulphur, 2 parts; shellac, 1 part. This gives a most intense blue.

4. Chlorate of potash, 20 parts; carbonate of copper, 14 parts; sulphur, 12 parts; mastic, 1 part.

5. Niter, 12 parts; sulphide of antimony, 2 parts; sulphur, 4 parts; lampblack, 2 parts. All these compositions should be moistened with gum water, and in No. 3 the stearine employed must be in fine powder.

Violet Stars.—Chlorate of potash, 9 parts; nitrate of strontia, 4 parts; sulphur, 6 parts; carbonate of copper, 1 part; calomel, 1 part; mastic, 1 part.

White Stars.—Saltpeter, 9 parts; sulphur, 3 parts; antimony, 2 parts.

Slow Fires, to be Heaped upon a Tile in Shape of a Cone, and Lit at Top.

Colors.	Scarlet.			Green.			Purple.		Yellow.		Crimson.	
Nitrate of strontium	16	24	108	—	—	—	108	72	20	—	40	36
Nitrate of barytes	—	—	—	16	16	16	—	—	—	10	—	—
Oxalate of soda	—	—	—	—	—	—	—	—	3	5	—	—
Sulphure of copper	—	3	30	—	—	—	24	3	—	—	—	—
Chlorate of barytes	—	—	—	—	—	12	—	—	—	—	—	—
Chlorate of potash	1	3	12	1	1	—	9	4	2	2	5	4
Charcoal, fine	1	—	—	1	—	—	—	—	—	—	2	—
Calomel	—	6	24	—	5	9	24	18	—	—	—	—
Sulphur, washed	4	8	39	4	2	7	39	24	4	1	13	12
Shellac	—	1	2	—	2	1	2	3	2	6	—	1
Vegetable black	—	—	1	—	—	—	1	2	—	—	—	1
Sulphide of antimony	—	—	—	—	—	—	—	—	—	—	4	4

In order to get the powder into a conical heap, press it into a wineglass, or lay a tile upon the top, and invert.

To Make Slow Match.—Dissolve 1 drm. nitrate of lead in ½ oz. boiling water. Cut a sheet of blotting paper in six equal parts, and wet them on both sides, with a sash tool, with the solution. When dry, paste a piece all over, and upon it smoothly press another piece; upon this, pasted, put a third piece; and so on, till all the six form a stiff board. Lay them under a heavy weight; and, when dry, with a sharp knife and straight edge, cut the whole into strips a quarter of an inch broad. Four inches will burn about a quarter of an hour. Narrow tape, boiled in the solution, makes excellent slow match.

Squibs, Compositions for.—1. Meal powder, 20 parts; niter, 6 parts; sulphur, 4 parts; E. charcoal, 4 parts.

2. Meal powder, 16 parts; E. charcoal, 2 parts.

3. Meal powder, 24 parts; niter, 4 parts; E. charcoal, 4 parts; sulphur, 1 part.

4. Meal powder, 16 parts; niter, 6 parts; sulphur, 4 parts; E. charcoal, 3 parts. Weigh out all the ingredients, mix them thoroughly, and pass the composition through a sieve at least three times. The composition cannot be overmixed.

Squib and Serpent.

Number	1	2	3
Sulphur	1	—	—
Charcoal	1	1	—
Niter	2	—	—
Meal powder	8	8	4
Steel filings	—	—	1

Stars, Crimson.—1. Chlorate of potash, 24 parts; nitrate of strontia, 32 parts; calomel, 12 parts; sulphur, 6 parts; shellac in fine powder, 6 parts; sulphide of copper, 2 parts; fine charcoal, 2 parts.

2. Chlorate of potash, 12 parts; nitrate of strontia, 20 parts; sulphur, 11 parts; charcoal, 2 parts; antimony, 2 parts; mastic, 1 part.

3. Nitrate of strontia, 72 parts; sulphur, 20 parts; gunpowder, 6 parts; coal dust, 2 parts.

No. 1. *Mauve and Lilac Stars and Lances.*

Number	1	2	3	4	5	6	7	8	9	10
Chlorate of potash	28	17	60	40	25	24	24	25	12	6
Calomel	12	—	—	—	10	12	12	—	—	2
Shellac	4	—	—	—	5	5	5	—	—	1
Nitrate of strontium	4	4	25	14	—	4	—	16	16	1
Sulphide of copper	2	7	20	—	5	2	2	—	—	1
Stearine	1	—	—	—	1	—	1	—	—	—
Sulphur, washed	—	7	35	16	—	—	—	12	2	—
Chloride of lead	—	1	—	2	—	—	—	—	—	—
Nitrate of lead	—	—	—	—	10	—	12	1	—	—
Oxychloride of copper	—	—	8	12	—	—	—	6	—	—
Salammoniac	—	—	1	—	—	—	—	—	—	—
Vegetable black	—	—	—	1	—	—	—	1	1	—
Niter	—	—	—	2	—	—	—	2	1	—
Carb'nate of strontium	—	—	—	—	5	—	4	—	—	—
Orpiment or realgar	—	—	—	—	—	—	1	—	1	—

The following refers to table No. 6, page 482: If powdered nitrate of barytes and shellac, crushed by being hammered in a bag, are mixed together and melted in a pipkin over the fire, the mixture, when cold, may be reduced to a powder in an iron mortar with patience. Take No. 6. Weigh out 21 parts nitrate of barytes, and 2 parts coarsely powdered lac; melt them together; when cold, powder them, and add the other substances in proper proportion. Shellac may be melted with nitrate of strontian, in the same way.

No. 2. *Sugar Blues for Stars and Lances.*

Number	1	2	3	4	5	6	7	8	9	10
Chlorate of potash	8	36	40	40	36	9	44	40	6	2
Calomel	4	18	24	24	12	3	12	—	5	1
Loaf sugar	3	12	9	12	4	1	12	9	4	—
Sulphuret of copper	5	22	22	12	4	3	12	22	—	—
Stearine	—	1	2	1	3	1	1	2	—	—
Oxychloride of copper	—	—	—	3	4	2	5	—	—	—
Salammoniac	—	—	—	—	—	—	—	6	—	—
Copper filings	—	—	—	—	—	—	—	—	1	—
Black oxide of copper	—	—	—	—	—	—	—	—	—	—

No substance combines better with salts of copper than sugar. Sugar, put into the bowl of a tobacco pipe and placed in the fire, burns fiercely, and is converted into caramel. This poured on to a plate, slightly smeared with butter to prevent it sticking, hardens on cooling; and is used for coloring brandy, vinegar, gravy, porter, coffee, etc. Stearine must be scraped very fine from a Stearine candle. Sugar blues are to be damped with pure water only, as the sugar itself, when wetted, is sufficiently cohesive. Use an exceedingly small quantity of water, and rub it up thoroughly in the mortar; the longer it is rubbed, the better it combines.

The following refers to table No. 10, page 482: It is impossible to powder shellac sufficiently fine by hand; and, twenty years ago, powdered shellac could not be procured. About that time the drug grinders, finding a demand for it, submitted it to the action of the stamping mills (mechanical pestle and mortar), and now it can be obtained at most shops.

Chertier mixed flake shellac with salt; melted the two together; powdered the mixture; and washed out the salt. Such process is needless now. It is useless, unless as fine as wheaten flour.

No. 4. *Steel Stars for Rockets and Shells.*

Number	1	2	3	4	5
Nitrate of lead	8	24	28	—	—
Chlorate of potash	3	5	6	5	4
Charcoal	2	6	6	1	—
Steel filings	2	6	6	3	4
Niter	—	4	3	—	—
Shellac, fine	—	—	1	—	—
Sulphur, washed	—	—	—	1	1

Rub up the mixture thoroughly in a mortar, with just enough boiled oil to make it cohere, and pump it into Roman candle stars; the oil will preserve the steel from rusting. For Roman candles or Italian streamers they will be ready at any time; for rockets and shells they may be matched and enveloped, like figure 32, a day or two previously. They form beautiful stars. Or they may be charged in cases, and primed with chlorate meal powder. Or they may be damped with lac solution.

No. 5. *Pearl Streamer.*

Number	1	2	3	4	5
Niter	12	26	2	—	—
Charcoal	5	11	1	—	—
Zinc filings	14	28	4	10	15
Meal powder	—	—	1	8	12
Vegetable black	—	—	—	1	1

Instead of filings, zinc may be obtained in a fine powder, by pouring it, melted, into a hot iron mortar, and hammering it with the pestle directly it begins to solidify. Sift it through a fine sieve. Protect the hands with cloth gloves while using the pestle. Damp the composition with gum water for Roman candle stars. Broken bits of the stars may be put into colored gerbes.

No. 3. *Purple and Violet Stars and Lances.*

Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Chlorate of potash	42	28	48	16	6	16	3	6	26	30	96	24	20	32	37
Nitrate of strontium	42	14	48	—	4	—	—	1	—	—	24	—	—	—	—
Sulphur, washed	13	—	28	2	1	6	1	3	—	3	—	2	6	12	9
Calomel	12	14	28	7	2	6	2	2	20	8	48	8	8	12	13
Sulphide of copper	4	1	40	8	1	—	3	—	3	12	1	—	—	—	—
Shellac	4	5	1	—	1	—	—	—	—	4	—	1	1	2	8
Vegetable black	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Black oxide of copper	—	—	—	—	—	4	4	1	—	—	—	—	—	1	1
Carbonate of strontium	—	—	—	—	—	—	—	—	4	12	—	—	—	—	—
Loaf sugar	—	—	—	—	—	—	—	—	14	—	42	—	—	—	—
Oxychloride of copper	—	—	—	—	—	—	—	—	—	—	—	4	5	8	9
Stearine	—	—	—	—	—	—	—	—	—	—	—	2	2	—	1

No. 6. *Green or Emerald Stars and Lances.*

Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Chlorate of potash	16	8	132	32	144	8	3	1	—	16	6	12	16	3	48	22	24	108	24	16	2	13
Nitrate of barytes	16	8	108	54	160	21	2	—	—	8	7	5	8	3	42	22	32	108	32	48	10	32
Chlorate of barytes	—	—	—	—	—	3	2	2	4	8	3	4	4	—	—	—	—	—	—	—	—	—
Sulphur, washed	5	4	6	6	4	7	1	1	1	5	—	—	1	—	—	—	10	18	8	12	2	8
Charcoal, fine	1	1	—	—	—	1	—	—	—	1	—	1	—	—	—	—	—	—	—	1	1	2
Sulphide of antimony	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—
Calomel	—	—	48	27	100	—	—	—	—	—	5	2	2	2	—	10	—	48	—	8	—	—
Shellac	—	—	24	12	12	2	—	—	—	—	—	3	4	—	7	1	—	24	—	5	—	—
Vegetable black	—	—	1	1	1	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—
Loaf sugar	—	—	—	—	—	—	—	—	—	—	5	—	—	2	7	14	—	—	—	—	—	—
Sal ammoniac	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5	—	—	—	—	—	—	—
Orpiment, or Realgar	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	—	3	—	—	—
Sulphide of copper	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—

No. 7. *Deep and Pale Yellow Stars and Lances.*

Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Chlorate of potash	8	4	12	16	12	16	4	4	16	3	8	16	16	4	8	6	20	5	6
Oxalate of soda	3	2	8	4	4	4	3	1	4	4	4	5	—	1	—	4	15	—	3
Bicarbonate of soda	—	—	—	—	—	—	—	—	—	—	—	—	3	—	3	—	—	1	—
Nitrate of strontium	—	—	—	—	—	—	20	—	—	—	16	—	4	—	—	—	—	—	—
Carbonate of strontium	—	—	—	3	2	3	—	—	—	—	—	—	—	—	—	—	—	—	—
Nitrate of barytes	—	—	—	—	—	—	—	—	4	10	—	—	3	—	—	—	7	30	—
Sulphur, washed	—	—	—	4	4	4	—	1	2	—	—	61	5	—	—	—	3	8	1	2
Shellac	2	1	3	—	1	1	5	—	2	3	1	—	4	1	—	—	1	4	—	1
Stearine	—	—	—	—	—	1	—	—	1	—	—	—	—	—	—	—	—	—	—	—
Charcoal, fine	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	1	—	—
Orpiment, or realgar	—	—	—	1	1	1	—	—	—	—	—	—	—	—	—	1	—	—	1	—
Loaf sugar	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	3	—	—	—	—

No. 8. *White or Bright Stars and Lances.*

Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Meal powder	3	3	2	1	1	1	1	1	3	—	—	—	—	—	—
Sulphur	4	6	4	2	3	2	2	1	11	5	7	—	8	2	1
Niter	8	14	14	5	10	6	9	4	48	24	34	18	—	—	—
Sulphide of antimony	1	—	1	—	3	—	2	1	10	5	6	3	1	1	2
Sulphide of arsenic, realgar	—	—	—	1	—	1	—	—	—	3	5	—	—	—	—
Minium, or red lead	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—
Nitrate of lead	—	—	—	—	—	—	—	—	—	—	—	3	16	3	12
Chlorate of potash	—	—	—	—	—	—	—	—	—	—	—	28	16	4	3
Shellac	—	—	—	—	—	—	—	—	—	—	—	5	—	—	1

No. 9. *Blue Stars and Lances without Sugar.*

Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Chlorate of potash	5	40	18	40	6	8	48	40	24	16	30	24	8	22	40	6	16	24	2	5	40	40	36
Calomel	4	20	8	28	2	2	12	12	6	8	10	8	1	8	20	3	1	8	—	—	—	—	12
Sulphide of copper	4	20	10	28	—	2	—	—	—	—	—	—	3	6	25	5	—	—	—	1	20	22	—
Shellac	1	5	—	—	—	—	2	2	1	—	—	1	—	—	5	—	—	1	—	—	5	—	6
Oxychloride of copper	—	2	—	—	—	—	8	—	6	5	10	4	1	2	—	—	2	—	1	1	—	—	9
Dextrine	—	—	5	10	—	—	—	9	—	—	—	—	—	2	2	—	—	—	—	—	—	—	—
Sulphur	—	—	—	—	3	4	4	1	1	2	3	2	3	5	—	—	4	2	1	2	5	5	9
Stearine	—	—	—	3	—	1	—	2	2	3	1	—	—	—	—	—	—	—	—	—	—	3	1
Black oxide of copper	—	—	—	—	1	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Copper filings	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5	—	—	—	—	—
Sal ammoniac	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	6	—

No. 10. *Crimson and Scarlet Stars and Lances.*

Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Chlorate of potash	16	8	16	16	24	16	24	16	8	16	25	4	32	6	16	28	32	26	96	8	24	8	2	13
Nitrate of strontium	16	16	32	32	—	16	20	24	5	6	30	7	48	5	—	—	42	10	72	12	18	12	8	32
Sulphur, washed	5	6	9	12	6	5	10	—	1	—	10	1	6	—	—	—	13	5	24	2	—	2	2	8
Charcoal, fine	1	1	1	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	2
Shellac	—	1	4	2	2	—	—	7	1	4	3	1	12	1	—	—	4	3	21	4	5	3	—	—
Calomel	—	—	7	—	6	1	—	14	2	2	9	2	12	5	—	12	12	10	42	—	—	4	—	—
Sulphide of copper	—	—	3	1	—	—	—	1	1	1	3	1	—	1	—	—	4	1	4	1	5	—	—	—
Realgar, or orpiment	—	—	—	—	1	5	1	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—
Vegetable black	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	1	—	—	—	—	1	—	—	—
Loaf sugar	—	—	—	—	—	—	—	—	—	—	—	—	—	7	12	—	—	—	—	—	—	—	—	—
Carbonate of strontian	—	—	—	—	10	—	—	—	—	—	—	—	—	11	5	—	—	—	—	—	—	—	—	—

No. 11. *Tailed, Streamer, or Comet Stars, for Rockets, Shells and Roman Candles.*

Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Vegetable black	1	3	3	6	—	—	—	—	3	1	—	—	—	—
Charcoal	2	8	2	3	1	3	6	12	2	4	1	1	3	—
Sulphur	5	24	2	—	2	4	1	2	2	12	3	3	8	—
Nitter	5	24	9	—	—	—	10	20	9	12	4	4	4	—
Meal powder	8	30	6	16	—	20	5	7	6	8	3	3	12	2
Oxalate of soda	—	—	—	—	4	12	—	—	—	—	—	—	—	—
Sulphide of antimony	—	—	—	—	—	—	—	—	4	—	—	—	—	—
Chlorate of potash	—	—	—	—	8	16	—	—	—	—	—	—	—	—
Asphaltum, Egyptian	—	—	—	—	—	—	—	—	—	—	1	—	—	—
Burgundy pitch	—	—	—	—	—	—	—	—	—	—	—	1	—	—
Coke grains, fine	—	—	—	—	—	—	—	—	—	—	—	—	4	1

Oiled Tailed Stars for Rockets and Shells.

Number	1	2	3
Charcoal	9	6	2
Sulphur	9	5	2
Niter	32	18	9
Meal powder	24	12	5
Sulphide of antimony	16	9	4

To 1 oz. add 24 drops of boiled linseed oil; rub them thoroughly together in a mortar; then spread out the mixture for a few days to dry. When dry, mix with starch, dextrine solution, or gum water, and chop into ⅜ or ½ in. cubical blocks. They will keep for years, and improve by age. In order that a star may tail, it must rapidly burn through and leave a cinder, or scoria; from this, as it falls, minute portions become detached, and trail behind.

Magnesium Colors for Stars and Asteroids.

Colors.	Crimson.	Scarlet.	Green.	Blue.	Yellow.	White.
Nitrate of strontium	8	6	—	—	—	—
Chloride of barytes	—	—	12	—	—	—
Oxychloride of Copper	—	—	—	2	—	—
Oxalate of soda	—	—	—	—	2	—
Sulphide of antimony	—	—	—	—	—	1
Chlorate of potash	2	4	—	5	4	—
Niter	—	—	—	—	—	12
Sulphur	2	2	1	2	—	4
Charcoal	1	—	—	—	—	—
Shellac	—	2	3	1	1	—
Calomel	—	4	—	2	—	—
Magnesium filings	2	3	2	2	1	2

A few magnesium filings may be added to any color.

Star Lights, Composition for.—Fine dry niter, 20 parts; sulphur, 6 parts; lampblack, 3½ parts.

Starting Fire.

Number	1	2	3
Charcoal	1	3	2
Meal powder	8	16	12
Sulphur	—	4	2
Niter	—	6	3

Streamers.—Streamers or quick matches, used for communicating fire quickly from one tube to another in display pieces, are composed of the following composition packed in slender continuous paper tubes:

Niter	2 oz.
Sulphur	1 oz.
Mealed powder	16 oz.
Charcoal	4 oz.

To Make Touch Paper.—Dissolve ½ oz. of niter in ½ pt. of hot water. Procure some 12 lb. double crown blue, cut each sheet into four equal parts, fifteen by ten. Lay them smooth upon each other, and, with a sash tool dipped into the niter solution, wash them over on one side, and hang them up to dry.

Wasp Light.

Number	1
Nitre	14
Sulphur	5
Meal powder	3
Realgar	1

Tourbillion.

Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Sulphur	1	3	3	7	3	4	4	4	2	4	1	7	4	1
Niter	4	5	16	10	8	32	17	17	4	8	8	20	14	4
Charcoal	2	3	8	4	3	6	4	5	—	—	—	—	3	2
Meal powder	1	4	8	24	16	32	—	—	4	9	10	23	13	1
Steel filings	—	—	—	8	6	5	—	—	—	—	—	—	2	1
Cast iron borings	—	—	—	—	—	8	6	8	3	4	7	14	5	—

Wheel and Fixed Cases.

Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Meal powder	8	24	8	36	4	18	8	12	42	4	16	10	13	16	20	40	38
Sulphur	1	1	—	1	—	—	1	1	5	—	—	—	1	—	1	4	1
Charcoal	1	4	1	4	1	—	—	—	—	—	—	—	—	—	—	3	2
Niter	2	3	—	—	2	2	1	3	8	—	2	—	1	—	—	24	4
Steel filings	—	—	—	—	—	5	3	3	5	1	5	—	—	—	—	6	—
Vegetable black	—	—	—	—	—	—	—	—	—	—	—	1	2	—	—	1	—
Realgar	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1	—
Litharge	—	—	—	—	—	—	—	—	—	—	—	—	—	3	3	2	—

Case Colors for Wheels, Compositions for—1. White.—Niter, 10 oz.; sulphur, 3 oz.; regulus antimony, 2 oz.; realgar, 1 oz.; red lead, ½ oz.; shellac, ½ oz.

2. Golden Yellow.—Potassium chlorate, 8 oz.; barium nitrate, 2 oz.; shellac, 2 oz.; sodium oxalate, 1½ oz.; stearine, ½ oz.

3. Orange.—Potassium chlorate, 8 oz.; strontium chlorate, 1 oz.; barium nitrate, 2 oz.; shellac, 2 oz.; sodium oxalate, 1½ oz.

4. Mauve.—Potassium chlorate, 12 oz.; mercurous chloride, 4 oz.; strontium nitrate, 2 oz.; copper subsulphate, 2 oz.; shellac, 2 oz.; stearine, ½ oz.

5. Rich Crimson.—Potassium chlorate, 9 oz.; strontium nitrate, 5 oz.; shellac, 2 oz.; mercurous chloride, 1½ oz.; copper sulphide (fused), 1 oz.; lampblack, ¼ oz.

6. Red.—Potassium chlorate, 8 oz.; strontium nitrate, 5 oz.; shellac, 2 oz.; mercurous chloride, 1 oz.

7. Brilliant Green.—Potassium chlorate, 10 oz.; barium nitrate, 5 oz.; shellac, 2 oz.; mercurous chloride, 2 oz.; pure sulphur, 1 oz.; copper sulphide, ¾ oz.; fine charcoal, ½ oz.

8. Rich Emerald Green.—Potassium chlorate, 18 oz.; barium nitrate, 9 oz.; barium chlorate, 5 oz.; shellac, 4 oz.; mercurous chloride, 2 oz.; copper powder, 1 oz.; pure sulphur, 1 oz.

9. Bright Blue.—Potassium chlorate, 7 oz.; mercurous chloride, 4 oz.; Chertier's copper, 4 oz.; dextrine, 1½ oz.; stearine, ½ oz.

10. Bright Blue.—Potassium chlorate, 8 oz.; Chertier's copper, 7 oz.; mercurous chloride, 3 oz.; shellac, 1 oz.; stearine, 1 oz.

11. Rich Blue.—Potassium chlorate, 8 oz.; copper subchloride, 2 oz.; shellac, ½ oz.; mercurous chloride, 3 oz.; stearine, 1 oz.

All the ingredients must be perfectly dry and fine enough to pass through a forty mesh sieve. They should be thoroughly well mixed and the compositions should be kept in stoppered bottles ready for use.

Quantivalence.—The term quantivalence of an atom, or of a group of atoms, is used to express the number of hydrogen atoms with which it can be combined or for the number for which it can be exchanged. Atoms are classified according to the combining or exchanging power into monads, dyads, triads, pentads, hexads and heptads, or else are designated as univalent, bivalent, trivalent, quadrivalent, etc. The quantivalence is indicated by Roman numerals placed above the chemical symbol, as O'' or C^{IV}. The words valence, equivalence and atomicity are used instead of quantivalence, but the term atomicity is used more properly when it refers to the number of atoms in a molecule.

Quartz, to Polish. See **Polishing.**

Queen's Metal.—A species of pewter. See **Alloys.**

Quills.—*Prep.* Suspend the quills in a copper, over water sufficiently high to touch the nibs; then close it steam tight and apply four hours' hard boiling; next withdraw and dry them, and in twenty-four hours cut the nibs and draw out the pith; lastly, rub them with a piece of cloth and expose them to a moderate heat in an oven or stove. The quills prepared in this way are as hard as bone, without being brittle, and as transparent as glass.

Radicle.—*Syn.* Radical.—In accordance with the well known binary theory of the constitution of saline compounds, every salt is composed, like chloride or sodium of two sides or parts, which are termed its radicals. That part of a salt which consists of a metal, or of a body exercising the chemical functions of one, is called a metallic, basic radical; while the other part, which, like chlorine, by combining with hydrogen, would produce an acid, is designated the acidulous radical. Every salt, therefore consists of a basic and of an acid radical.

Raisin Cider. See **Cider.**

Raspberry Vinegar. See **Vinegar.**

Ratafia.—Ratafia, for flavoring, is by no means difficult to make when the peach is in season. The following is a simple recipe: Blanch 2 oz. of peach or apricot kernels; bruise them well; put them into a bottle, and fill it nearly up with good brandy; dissolve in a cup of cold water ½ lb. of white sugar candy, and add it to the brandy after it has stood for a month on the kernels; strain off the kernels before you add the sugar; then filter through paper, and bottle off in small bottles for use. Another rather more expensive method of making it is to take 50 bruised peach kernels, ¼ lb. of bitter almonds, 1 lb. of white sugar candy, and mix thoroughly with 1½ pt. of 90% alcohol; then add 3 qt. of water and 1½ gal. of malt spirits.—*Confectioners' Journal.*

Ratafias. See **Liquors.**

Rats, to Destroy.—1. When a house is infested with rats which refuse to be caught by cheese and other baits, a few drops of the highly scented oil of rhodium poured on the bottom of the cage will be an attraction which they cannot refuse.

2. Place on the floor near where their holes are supposed to be a thin layer of moist caustic potash. When the rats travel on this, it will cause their feet to become sore, which they lick, and their tongues become likewise sore. The consequence is that they shun this locality, and seem to inform all the neighboring rats about it, and the result is that they soon abandon a house that has such a preventive.

3. Cut some corks as thin as wafers, and fry, roast, or stew them in grease, and place the same in their track; or a dried sponge fried or dipped in molasses or honey, with a small quantity of bird lime or oil of rhodium. v ill fasten to their fur and cause them to depart.

4. If a live rat be caught and smeared over with tar or train oil, and afterward allowed to escape in the holes of other rats, he will soon cause all to take their departure.

5. If a live rat be caught, and a small bell be fastened around his neck, and allowed to escape, all of his brother rats as well as himself will very soon go to some other neighbor's house.

6. Take a pan, about twelve inches deep, and half fill it with water; then sprinkle some bran on the water and set the pan in a place where the rats most frequent. In the morning you will find several rats in the pan.

7. Two parts common squills (well bruised) and 3 parts of finely chopped bacon are made into a stiff mass, with as much meal as may be required, and then baked in small cakes, which are put around for the mice to eat.

Razors, to *Grind* and Set.—Razors that have been in use so long that the edge is rounded by strapping can be brought to a flat bevel on the edge by placing them on a perfectly flat hone or other fine grained stone, with a little thin oil, as lard oil or fine machine oil, letting the back always rest upon the stone, and with small circular motions of the hand, without pressure, grinding down the bevel until the stone marks meet on both sides in a thin feather edge. The regular razor hone as imported through the cutlery trade from England is the best. The finest washed flour emery, laid on a flat piece of wood with glue and pressed down with a flat piece of iron or plate glass, or a strip of emery paper glued to a strip of wood and pressed upon a flat iron or piece of glass, will answer the purpose. In using the emery stick always draw the razor backward from the cutting edge, to prevent catching and hacking the edge against any uneven particles of emery. For a strap use a strip of fine, even calfskin, glued to a piece of wood, on which rub a little paste made of ox-

ide of iron (rouge) mixed with olive oil. Draw backward and keep the heel or back of the razor in contact, so as not to round the edge. Oxide of tin or putty powder mixed with oil also makes a good razor strap paste. The skin of a horse's tail is very highly recommended for razor straps.

Razor Paper. See **Paper.**

Razor Paste.—1. Mix fine emery intimately with fat and wax until the proper consistency is obtained in the paste, and then rub it well into the leather strap. Prepare the emery by pounding thoroughly in a mortar the coarse kind, throwing it into a large jug of water and stirring well. Immediately the large particles have sunk, pour off into a shallow plate or basin and let the water evaporate. This emery is better for polishing and other purposes than that prepared at the emery mills.

2. The grit from a fine grindstone is very efficient for a razor paste.

3. Levigated oxide of tin, prepared putty powder, 1 oz.; powdered oxalic acid, ¼ oz.; powdered gum, 20 grn.; make into a stiff paste with water, and evenly and thinly spread it over the strop. With very little friction this paste gives a fine edge to the razor, and its efficiency is still further increased by moistening it.

4. Emery reduced to an impalpable powder, 2 parts; spermaceti ointment, 1 part; mix together and rub it over the strop.

5. Jewelers' rouge, black lead and suet, equal parts; mix.

6. Pradier.—Best putty powder, 1½ oz.; jewelers' rouge, 1½ oz.; scales of iron, ¾ oz.; levigated Turkey stone, 4½ oz.; beef suet, 2¼ oz.

7. Put equal parts of dried sulphate of iron and salt in a closed vessel and apply a gradually increased heat. Pulverize, elutriate, mix with lard or tallow.

Reagents, Chemical.—Reagents are substances which effect a chemical change in the molecule. Only the best quality of chemicals should be used. Very minute directions for preparing reagents are given in Fresenius, but this list of reagents, with their proper strengths, is complete enough for ordinary qualitative work. The following are the principal reagents used by the chemist, with the proper strength. Distilled water only should be used in making up reagents. For the various synonyms of the chemicals, see the appendix. The alphabetical arrangement is disregarded, and the reagents are given in the order in which they should be placed on the laboratory table.

Sulphuric Acid.—Concentrated sp. gr. 1·843. Dilute should also be provided. To 5 parts water add 1 part sulphuric acid.

Hydrochloric Acid.—Concentrated sp. gr. 1·12, 24% acid is the usual reagent strength. Both concentrated and dilute should be provided.

Nitric Acid.—Concentrated acid should be purchased and diluted to sp. gr. 132, 32% acid.

Acetic Acid—Sp. gr., 1·04, 30% acid. This acid is called the No. 8 of commerce.

Ammonia.—Strong, sp. gr., 0·96. Keep in a bottle with a ground glass stopper.

Ammonium Carbonate.—Dissolve 1 part of the salt in 4 parts by weight of distilled water, to which 1 part reagent ammonia has been added.

Ammonium Chloride.—Dissolve part of the salt in 8 parts water.

Ammonium Sulphide.—Purchase of the right strength; it is an article of commerce.

Ammonium Oxalate.—Dissolve 1 part of the salt in 24 parts water.

Potassium Hydroxide.—Dissolve 1 part of the stick alkali in 20 parts of water.

Sodium Hydroxide.—Use about 1 part to 9 parts of water.

Potassium Carbonate.—Dissolve 1 part of the dry salt in 10 parts of water.

Potassium Iodide.—Dissolve 1 part of the dry salt in 20 parts of water.

Potassium Bichromate.—Dissolve 1 part of the salt in 10 parts of water.

Potassium Ferro-cyanide.—Dissolve 1 part of the crystallized salt in 12 parts of water.

Potassium Sulpho-cyanide.—Dissolve 1 part of the salt in 25 parts of water.

Calcium Hydroxide.—Slake lime by the addition of 6 parts water, after which add 30 parts water and allow to stand, decant the liquid and add 300 parts water to the residue, let the coarser particles subside, then pour the liquid containing the finely divided lime in suspension into a bottle and use the liquid.

Barium Chloride.—Dissolve 1 part of the salt in 10 parts of water.

Magnesium Sulphate.—Dissolve 1 part of the salt (cryst.) in 10 parts water.

Mercuric Chloride.—Dissolve 1 part of the crystallized salt in 16 parts of water.

Silver Nitrate.—Dissolve 1 part of the crystallized salt in 70 parts water. Another authority says to use 1 part of the salt in 20 parts of water. Keep in an orange colored bottle.

Lead Acetate.—Dissolve 1 part of the salt in 10 parts of water, and filter.

Ferric Chloride.—Dissolve 1 part of the iron in 15 parts of water.

Alcohol.—Use 96% alcohol.

Cobaltous Nitrate.—Dissolve part of the salt in 10 to 20 parts of water.

Sodium Sulphite.—Dissolve 1 part of the salt in 5 parts of water.

Potassium Cyanide.—Dissolve 1 part of the salt in 3 or 4 parts of water.

Potassium Chromate.—Dissolve 1 part of the salt in 10 parts of water.

Potassium Ferricyanide.—Dissolve 1 part of the salt in 12 parts of water; make as required for use.

Potassium Sulphate.—Dissolve 1 part of the salt in 12 parts of water.

Potassium Permanganate.—Dissolve 1 part of the salt in 400 or 500 parts of water.

Carbon Bisulphide.—Use at the same strength as purchased.

Ether.—Use same strength as purchased.

Calcium Sulphate.—Saturated solution.

Copper Sulphate.—Dissolve 1 part of the salt in 10 parts of water.

Calcium Chloride.—Dissolve 1 part of the salt in 8 parts of water.

Sodium Carbonate.—Used largely in blowpipe work. Used as purchased; buy the C. P.

Ferrous Sulphate.—The solution of this salt does not keep well, so it should be prepared as required for use, by dissolving 1 part of the salt in 8 parts of water.

Sodium Borate.—Used in blowpipe work. Get the pure crystallized salt.

Sodium-Ammonium Phosphate.—This is the microcosmic salt. It is used in a dry state for blowpipe work.

Ferrous Sulphide.—Use as purchased.

Metallic Zinc.—Use the granulated zinc.

Potassium Chlorate.—Use as purchased.

Starch Paste is also used extensively. It should be kept in tin or a salt mouth, and only made up as wanted.

Soap Solution, Clark's. See **Soaps.** *Soap Solution.*

Phenol Phthalein. See **Phenol Phthalein Solution.**

Realgar.—Arsenic bisulphide or red sulphide of arsenic. It is easily fused and is deadly poison.

Rectification.—A second distillation of a fluid for the purpose of rendering it purer.

Red Lead.—Pb_3O_4 or minium.

Red Pigments. See **Pigments.**

Reduction.—Reduction is the term applied to a process by which the oxygen is withdrawn from a metallic oxide, leaving the base in its original state. This is effected by heating the oxide with carbon or hydrogen; or by exposing it to the action of some other body which

has a powerful affinity for oxygen. When hydrogen is employed, the metallic oxide is heated to redness in a glass or porcelain tube, and subjected to a current of hydrogen gas, which absorbs the oxygen and leaves the metal pure. Other agents, as tallow, oil, resin, sugar and starch, are sometimes used for reducing, but carbon and hydrogen are generally employed.

Reduction of Density of Negatives. See **Photography.**

Regulus.—Certain metals, such as copper and silver, possess a strong affinity for sulphur, and may be converted into sulphides by fusion with such bodies as iron pyrites or the sulphates of barium and lime. The sulphide thus formed is called a regulus or matt. In a similar way, nickel and cobalt are converted into arsenides by their combination with arsenic; the arsenide is then termed a speise. In smelting ores containing iron, copper, nickel, arsenic, sulphur, and silica, three products may be obtained: nickel, speise; copper, regulus; and iron, slag.

Removal of Paint. See **Cleansing.**

Resins. See also **Gums.**

Resin, Black.—The remains of turpentine after the oil has been distilled.—Rosin or colophony.

Yellow.—Yellow rosin.

Resin Paper. See **Paper.**

Resin, Violin Bow. See **Bow, Violin, Resin for.**

Retorts, Cement for. See **Cements.**

Retouching. See **Photography.**

Retouching. Varnish for. See **Varnishes.**

Reviver, Black. Take 2 pt. of vinegar, and infuse 1 oz. of iron filings, 1 oz. copperas, 1 oz. ground logwood, and 3 oz. bruised galls.

Kid Reviver. — Logwood, 4 parts; copperas, ½ part; water, 40 fl. parts; boil for ½ hour and strain into tragacanth (powdered), ¼ part; soft soap, 1 part; glycerine, 3 parts; add 1 fl. part methylated spirit, containing ¼ part salicylic acid; oil gaultheriæ, 4 minims; add water to make 40 fl. parts.

Rice Water.—Boil whole rice in water for a few minutes, and then strain the liquid. Its principal use is in a photographic process, now almost obsolete.

Ripening.—Term used in keramics to describe the tempering or rotting of the clay before manufacture.

Rivets.—The distance apart of the rivets used to connect two pieces of metal plate together is regulated by the rule that the joint sectional area of the rivets shall be equal to the sectional area of plate left after punching the rivet holes.—*Rankine.*

Rivet Metal. See **Alloys.**

Roasting.—Term used in metallurgy to describe a kind of calcination to which ores are submitted before their final reduction to the metallic state. Many substances, such as water, arsenic and sulphur, are driven off.

Rockets. See **Pyrotechny.**

Rollers, Ink, to Clean.—Rollers should not be washed immediately after use, as they will become dry and skinny, but they may be washed ½ hour before using again. In cleaning a new roller, a little oil rubbed over it will loosen the ink, and it should be scraped clean with the back of a knife; it should be cleaned this way for about a week, when lye may be used. New rollers are often spoiled by washing too soon with lye.

2. To Renew a Hard Roller.—Wash carefully with lye, then apply a thin layer of molasses. Let it stand all night, then wash with water, and let it hang until dry enough to use.

Rollers, Printers'. See **Printers' Rollers.**

Roman Vitriol.—A name given to copper sulphate.

Roofing, Fire Proof.—After the paper is put on take coal tar and lime (burnt, but not slaked), and boil them together in the proportion of 15 lb. lime to 100 lb. tar. Put it on hot. To pulverizo the lime, sprinkle it with a little water and sift it. To avoid the tar boiling over, stir the lime in the boiling tar very slowly. The mixture must always be heated before putting on. The lime and tar form a chemical connection, which is fire proof, cannot be melted by sun heat or dissolved by steam or hot water, and makes a smooth, glazed roof.

Roofs, Composition for.—Take 1 measure of fine sand, 2 of sifted wood ashes, and 3 of lime, ground up with oil. Mix thouroughly, and lay on with a painter's brush, first a thin coat and then a thick one. This composition is not only cheap, but strongly resists fire.

Root Beer. See **Beers.**

Rope.—A tarred rope is about ¼ weaker than untarred white rope. Tarred hemp and manilla ropes are of about equal strength. Wire rope of the same strength as new hemp rope will run on the same sized sheaves; but the greater the diameter of the latter, the longer it will wear. One wire rope will usually outlast three hemp ropes. Running wire rope needs no protection; standing rigging should be kept well painted or tarred.

Ropes, to Protect. See **Cleansing,** *Mildew.*

Rosemary, Spirit of.—

1. Rosemary tops	2½ to 3	lb.
Rectified spirit	5	pt.
Water	4	pt.

Digest twenty-four hours, and distill 1 gal.

2. Take of—

Oil of rosemary (recent)	1½ oz.
Proof spirit	1 gal.

Dissolve by agitation. Both are in high repute as hair cosmetics; also used to make extemporaneous rosemary water and in compound perfumes.

Rose Water. See **Waters.**

Rosin.—A name given to resin, either yellow or black. Another name is colophony.

Rosin, to Bleach. See **Bleaching.**

Rosin Oil. See **Oils.**

Rosolio de Turin. See **Liquors.**

Rouge.—Red Oxide of Iron.—1. It is prepared as follows: Make a boiling solution of iron sulphate, filter it, and add to it a concentrated solution of oxalic acid; this throws down yellow oxide of iron. Wash the precipitate, and heat it while still moist upon an iron plate, over a charcoal fire. At a temperature of 400° F, the salt is decomposed, and brownish red peroxide of iron, or rouge, is formed.

2. The rouge used by machinists, watchmakers and jewelers is a mineral substance. In its preparation crystals of sulphate of iron, commonly known as copperas, are heated in iron pots, by which the sulphuric acid is expelled and the oxide of iron remains. Those portions least calcined, when ground, are used for polishing gold and silver. These are of a bright crimson color. The darker and more calcined portions are known as crocus, and are used for polishing brass and steel. For the finishing process of the specula of telescopes, usually made of iron or of steel, crocus is invaluable; it gives a splendid polish.

3. Others prefer for the production of rouge the peroxide of iron precipitated by ammonia from a dilute solution of sulphate of iron, which is washed, compressed until dry, then

exposed to a low red heat and ground to powder.

4. A rouge suitable for fine work may be made by decomposing a solution of sulphate of iron with oxalic acid, also in solution; a precipitate of oxalate of iron falls, which must be well washed and dried; when gently heated the salt takes fire, leaving an impalpable powder of oxide of iron.

Rouge, Stick.—Stick rouge as used by the jewelers is supposed to be made with paraffine as a cementing element, as little as will hold the rouge together.

Rouges, Face Paints and Powders. See also **Powders** and **Cosmetics.**

Analyses of Face Powders of the Market.—By W. H. Snow in *New Idea.*

Swan Down.—Manufactured by Henry Tetlow.—

Zinc oxide	38·9%
Orris root	18·35%
French chalk	42·75%

Wright's.—A harmless face powder manufactured by Alfred Wright, of Rochester, N. Y.; claimed by its manufacturer to be entirely free from lead or other poisonous minerals, and no more hurtful in use than common starch. Upon examination it proved to be

French chalk	25·48%
Corn starch	33·73%
Bismuth oxide	0·8%
Calcium sulphate	40·19%

Saunders' Bloom of Ninon.—Saunders' pure white face powder, or Bloom of Ninon, manufactured by J. T. Saunders, Oxford street, London; claimed by its manufacturer to be a delicate preparation for beautifying the complexion, free from anything which can possibly injure the skin. Each box holds 1 oz. 25 grn. We offer the following formula:

Precipitated chalk	23·00 parts.
French chalk	23·76 parts.
Bismuth subcarbonate	6·64 parts.
Zinc oxide	16·60 parts.
Corn starch	30·00 parts.

Pozzoni's (White).—J. A. Pozzoni's complexion powder, manufactured in St. Louis, Mo., states on the label that it imparts a brilliant transparency to the skin, removes all pimples, freckles, and discolorations, makes the skin delicately soft, perfectly harmless, containing no arsenic or other deadly material. Found upon examination to be:

French chalk	55·95%
Calcium carbonate	31·25%
Bismuth oxy-chloride	12·8%

Palmer's Lily White Tablet for the complexion, prepared only by Solon Palmer, New York. Examination proved it to be:

Precipitated chalk	42·5%
French chalk	57·5%

Palmer's Invisible was found upon examination to be a silicate of alumina, magnesia, potash, and soda, colored with carmine. The natural silicate is probably French chalk.

[The foregoing are analyses merely, and are not to be taken as formulæ from which the various preparations may be compounded. Perfumes have to be added, and it is not necessary to adhere rigidly to the quantities given.]

The following is a valuable synopsis of the principal rouges and face paints and powders:

According to Mierzinsky, these preparations are not only in demand for toilet purposes, but are also indispensable to the actor and actress. They may be divided into fatty powders, fatty paints in sticks, palette paints, and liquid paints.

For the preparation of all these the following are necessary: Pure white French chalk, thoroughly washed with dilute acetic acid, carbonate of magnesia, oxy-chloride of bismuth, subnitrate of bismuth, chalk, lead, zinc, and barium whites, and coloring matters.

Fatty Powders.—These contain as basis pure white French chalk; in order to temper the character of this, it is mixed with magnesia, chalk, zinc, or lead white or bismuth. The finest paint is furnished by bismuth white, only it possesses the disadvantage in a higher degree than even lead white of turning brown in a sulphureted atmosphere. Zinc white has not the same drawback, but it fails in luster and is not so pure a white. The paint is colored red with carmine; pink with eosin, and flesh color with a mixture of eosin and aniline orange. Mostly the red paint is in demand, and it must be matched with the complexion. It should be kept both dark and pale. The following mixtures should be kept prepared:

90 parts French chalk with 30 parts carmine.
110 parts French chalk with 30 parts carmine.
125 parts French chalk with 25 parts carmine.

These can be rubbed up with a few drops of fatty oil and perfumed as desired. Coal tar colors must be dissolved before admixture, but the operator must proceed with great care, as the colors are greedily taken up by the French chalk.

Fatty Paints in Sticks.—1. These have wax, cacao butter, benzoated oil, or suet, with French chalk as bases. Sometimes a mixture of these may be used, sometimes benzoated suet with cacao butter, sometimes cacao butter alone.

The following formulæ give good results:

2. Take of—

White wax	2	parts.
Olive oil, or almond oil, or suet	3	parts.
French chalk	1	part.
Zinc oxide	1	part.

Mix.

3. Take of—

White wax	2	parts.
Oil or benzoated suet	2	parts.
Bismuth white	5	parts.

Mix.

No preparation of bismuth can be recommended.

These are colored red, if desired, with an ammoniacal carmine solution. The proportion of 1 part of carmine to 40 parts of base is most approved, and the best method of procedure is to dissolve 1 part of carmine in ½ part of strongest ammonia, to mix this solution with six parts of French chalk, and to stir until the ammonia has evaporated and the mixture become dry. This colored chalk is then mixed with a basis made from 13½ parts of wax and 20 of any fixed oil.

Palette Paints contain the same materials as the powders, rubbed with thin mucilage to a paste, and fixed on plates of porcelain with a very thick mucilage. These paints must be intensely colored. Cinnabar is frequently used for these paints as under:

4. Take of—

French chalk	190	grm.
Best cinnabar	30	grm.

Rub together with six drops of almond oil and then with a few drops of tragacanth mucilage. Not recommended; injurious to health.

Liquid Paints.—In these the whites or colors are suspended.

5. *Eau de Lys.*—Take of—

Zinc white	10	parts.
French chalk	10	parts.
Glycerine	20	parts.
Rose water	1,000	parts.

Mix.

6. *Lait d'Iris.*—Take of—

Bismuth white	10	parts.
Water	120	parts.

Mix. The water is perfumed with essential

oil of orris. Bismuth is a dangerous ingredient.

7. Take of—

Eosin	4	parts.
Distilled water	80	parts.
Glycerine	20	parts.
Eau de cologne	300	parts.
Spirit (free from fusel oil)	400	parts.

Dissolve. Allows to stand and filter. According to desire the proportion of eosin may be increased, or diminished, or modified with aniline orange.

8. Take of—

Finest carmine	20	parts.
Lead white	30	parts.
French chalk	60	parts.
Tincture of benzoin (simple)	5	parts.
Eau de cologne	50	parts.
Rose water	250	parts.

Mix.

9. Take of—

Carmine	4	parts.
Strongest ammonia	4	parts.
Rose water	500	parts.
Essence of rose	15	parts.

This liquid is principally used to give the lips the beautiful cherry red color which is so much admired.

Liquid Rouge.—Several different preparations are sold under this name, but the first of those following only strictly deserves it.

1. Dissolve pure rouge (carthamine) in alcohol, and acidulate the solution with acetic acid. Very rich.

2. A solution of carmine in liquor of ammonia, or in carbonate of potash water, to be diluted for use. Rich colored.

3. The red liquid left from the preparation of carmine. Inferior to the preceding.

Spanish Lady's Rouge.—This is properly rouge crepons; but cotton wool which has been repeatedly wetted with a strong ammoniacal solution of carmine, and dried, is usually sold for it. Used like rouge crepons.

Rouge de Carmin (fine rouge for theaters).—Take of carmine, 2 drm., and commingle it with a little warm water. Again, into a deep porcelain plate put 4 oz. finely powdered talc, and in the center of this powder make a cavity with the end of the finger, and pour in the carmine mixture, stirring all the while with an ivory or horn spatula. When the whole is well mixed, add 6 drops oil and a solution of gum tragacanth, and finish as before directed. The first shade of this rouge is very deep.

Second Shade.—Carmine, 2 drm.; talc, 4½ oz.; a little less of oil and gum.

Third Shade.—Carmine, 2 drm.; talc, 5 oz.; oil, 7 drops; and solution of gum, 15 drops. Thus proceed for the other degrees of color, by augmenting the proportions of gum and oil ½ oz. at each descending shade. Run down as low as ten variations.

Azure Paste.—Equal parts French chalk and ultramarine finely sifted. Triturate with gum tragacanth into a stiff paste.

Caution against Bismuth as a Cosmetic.—The continued use of bismuth white injures the skin. It will finally produce paralysis of its minute vessels, and will render the skin yellow and leather like.

Liquid Blanc de Perle (for theatrical use).—Rose or orange flower water, 1 pt.; oxide of bismuth, 4 oz. Mixed by long trituration.

Bloom of Roses.—Take of—

Soft water (boiling)	1	pt.
Lemon juice (recent, boiling)	¼	pt.
Dilute sulphuric acid (Ph. L.)	¼	oz.

Mix, add of—

Dried red rose leaves	3	oz.

And digest, in glass or glazed earthenware, with frequent stirring, for two hours. Then strain off and forcibly squeeze out the liquor from the leaves with the hands, and pass it through coarse muslin. Next add, and dissolve in it, of—

Gum arabic (fine pale)	1	oz.
Esprit de rose	½	fl. drm

Set it aside (corked) in a cool place for a few days; then decant the clear portion, or filter it through bibulous paper. Contact with alkalies and metals darkens and spoils its color.

Face Paint (Brown).—The general principle in making such preparations consists in mixing the dry powder, a little darker than the desired tint, with some fat, such as petrolatum or lard. A formula for a brown face paint is as follows:

Take of—

Burnt umber	1	part.
Cacao butter	6	parts.
Oil of neroli	5	drops.

Melt the cacao butter, add the umber, and while cooling make an intimate mixture, adding the perfume toward the last. Wash it off with vaseline.

Burnt Cork, for Minstrels.—

Take best lampblack	1	grn.
Cacao butter	6	grn.
Oil of neroli	5	drops.

Melt the cacao butter, add the lampblack, and while cooling make an intimate mixture, adding the perfume toward the last.

Paint, for Black Eyes.—Bismuth, 2 parts; talc, 1 part; color with carmine to skin tint. Wash the part with mixture of glycerine, 1 part; water, 5 parts; dry and apply powder.

Nigger Black.—Beat finest lampblack into a stiff paste with glycerine and apply with a sponge; if necessary mix a little water with it when using. This is far superior to the old fashioned burnt cork and beer, which required a lot of rubbing in, and almost skinned one's face to remove. The above can be as easily removed as it is applied.

White Face and Arms Lotion.—

Zinc oxide	½	oz.
Glycerine	2	oz.
Rose water	2	oz.

Superior to powders. Many of our leading actresses use the above.

Theatrical Face Paints.—The principle is to make a dry powder somewhat darker than the desired tint, and then thoroughly mix this powder with some bland oil (as almond oil), or some fat (as perfumed benzoated lard), or some perfumed paraffinoid (as petrolatum), in the proportions necessary to produce the required color and consistency. Hager and Torjesen give the following formulæ:

White.—1. Oxide of zinc, subnitrate of bismuth and plumbate of alumina—of each, 1 oz. Mix and make into a paste with almond oil (5 to 6 drm. required) and perfume with 12 minims of peppermint oil, 12 grn. of camphor, and 1 drm. of ess. bouquet.

2. Powd. Venetian talc 300 grm.
Bismuth oxychloride 50 grm.
Carmine 0·05 grm.
Oil bergamot 10 drops
Oil neroli 2 drops

Bright Red.—Oxide of zinc, subnitrate of bismuth and plumbate of alumina—of each, 10 drm.; resin, 2¼ grn., dissolved in 1 drm. of ess. bouquet; oil of peppermint, 12 minims; camphor, 12 grn.; almond oil, a sufficiency to make a paste. Mix as above.

Deep Bordeaux Red.—Oxide of zinc, subnitrate of bismuth, plumbate of alumina—of each, 15 drm.; oil of peppermint, 12 minims; camphor, 12 grn.; carmine, 30 grn. (dissolved in 80 minims of solution of ammonia); almond oil, a sufficiency; ess. bouquet, 1½ drm. Mix.

Red.—

Powdered Venetian talc	100	grm.
Carmine	2·5	grm.
Water of ammonia	20	grm.

Digest the carmine in the water of ammonia until dissolved, mix the solution with a portion of the powdered talc, and this with the remainder, and dry by exposure to the air.

Skin Color.—Vermilion, 3 drm.; tincture of saffron, 2 drm.; powdered orris, 5 drm.; precipitated chalk and oxide of zinc, of each, 20 drm.; camphor, 20 grn.; oil of peppermint, 20 minims; ess. bouquet, 1½ drm.; almond oil, a sufficiency. Mix.

Black.—1. Drop black (made by burning camphor and washing the soot with spirit), 2 drm.; almond oil, 2 drm.; cocoanut oil, 6 drm. Mix, perfume and cast into sticks.

2. Best lampblack	1	grm.
Cacao butter	6	grm.
Oil neroli	5	drops.

Melt the cacao butter, add the lampblack, and while cooling make an intimate mixture, adding the perfume toward the last.

Nose Paste for Comic Characters.—

Wheat flour	1	oz.
Pulverized tragacanth	2	drm.

Tint with carmine.

Take as much of the powder as necessary and knead into a stiff paste with a little water and apply to the nose, having previously painted it with spirit gum.

To Make Grease Paints.—Take clarified suet and mix color required with it and pour into round moulds.

Flesh Tint: Use white lead and chalk, equal parts, and vermilion to-suit. Three tints are required. Red, use vermilion; blue, use ultramarine; black, use finest drop black; white, use white lead. Perfume with bergamot.

Veins, Blue for the.—Blue, wherewith to imitate the veins, is made with exceedingly fine levigated French chalk, sifted through a silk sieve, tinted to the proper shade with Prussian blue, then made into a paste with very thin gum water; when dry it is put up in pots in the same way as rouge. After the complexion has been duly whitened with blanc, the veins are indicated with a little of the coloring applied with a pencil made of kid leather, the inside of the skin being made the outside of the pencil. Artistically used, the effect is pleasing and natural.

Vinaigre de Fard.—Powdered cochineal, 3 drm.; lake in powder, 3 oz.; alcohol, 6 oz.; distilled lavender vinegar, 1 lb. After ten days, infusion with frequent stirring, decant and filter.

Rubber.—*Rubber Cement.* See **Cements.**

Rubber, Cement for. See **Cements.**

Rubber, to Cut or Bore.—Dip the knife or cork borer in a solution of strong caustic potash.

Rubber (Old), to Digest.—Place the material, cut in small shreds, in a strong (boiler iron) air tight vessel, provided with a good safety valve, and introduce into it 4 or 5 parts of bisulphide of carbon for each part (by weight) of rubber. Close all the openings, and place the vessel over a suitable water bath, or, what is better, have a small steam coil inserted within the boiler. Heat for an hour at the boiling point of water. This will insure the complete solution of the rubber. The vapor of the bisulphide is very inflammable; and when mixed with air, it is explosive when ignited. For these reasons, as well as because of the offensive odor of the solvent, the operation is best conducted in the open air, and with steam heat only.

Dissolving Rubber.—The solution of India rubber or gutta percha in chloroform or benzole, frequently called for in photographic work, is usually attended with so many difficulties and drawbacks that in nine cases out of ten, says the *British Journal of Photography*, where the solution is required the experimentalist usually purchases it ready made. Yet there need be no difficulty about the matter. First, pure rubber should be obtained. When vulcanized, it is perfectly insoluble. Secondly, pure solvents are necessary. Chloroform containing a large excess of alcohol and water will fail to act even upon the purest rubber. Again, under the most satisfactory conditions, the action is very slow, and the amount of rubber capable of being taken up is proportionately very small. The plan usually adopted is to place a large amount of shredded rubber in a bottle, which is then filled up with the solvent, and shaken at intervals a few times; and when the shreds do not dissolve like pieces of sugar the whole is thrown aside, and we are written to for an explanation of the failure. If a small quantity of rubber had been placed in the bottle, and the liquid added, it would have been observed gradually to swell out very considerably after the lapse of some time, and a mixture of the whole would be facilitated by stirring with a glass rod or a splinter of wood. The rapidity with which the rubber absorbs the solvent will depend upon its condition; but the action is never very quick, nor is it in any way analogous to the dissolution of a crystal.

One cause of the failure of chloroform to act upon the caoutchouc may arise from the presence of alcohol in too great a proportion. Chloroform as sold almost always contains alcohol in small quantity, owing to the fact that when none is present it cannot be prevented from decomposing spontaneously, more especially in the light. It is, however, stated that when entirely protected from light absolute chloroform will not undergo any change.

A solution of gutta percha in chloroform has a use which is not generally known. It forms, when carefully made and filtered quite bright the best possible material for obscuring glass for focusing screens. For fine microscopic work it is said by those whose opinions are of weight to be unequaled.

Rubber, to Deodorize.—1. Place the articles, covered with charcoal dust, in an inclosed vessel, let them remain for several hours at a temperature of 94° F. Clean the charcoal dust from the articles; they will be odorless.

2. Caustic potash, ½ oz.; water, 1½ pt.; dissolve and heat to boiling. Put the goods into this for a few minutes, rinse thoroughly and dry.

3. Both sides of the article should be covered with a thin layer of animal charcoal. Heat for three or four hours from 122° to 140° F.

4. Equal parts of alcohol, 36%, and linseed oil, shaken together thoroughly. Apply to the hose with a cloth. Stretch the hose a little, and rub until nearly dry. Repeat 3 or 4 times at intervals of several days. This treatment renders the hose gas tight.

Rubber Hose, etc., to Soften.—1. Dip in petroleum, expose to the air, and repeat the operation if necessary.

2. Ammonia, 2 parts; water, 4 parts. Expose for a few minutes.

3. If very hard, soften with vapor of carbon bisulphide, with the further application of vapor of kerosene.

Joining Rubber.—Rubber is easily joined and made as strong as an original fabric, by softening before a fire, laying the edges carefully together, without dust, dirt, or moisture between. The edges so joined must be freshly cut in the beginning. Tubing can be united by joining the edges around a glass cylinder, which has previously been rolled with paper. After the glass is withdrawn the paper is easily removed. Sift flour or powdered soapstone through the tube to prevent the sides from adhering from accidental contact.

Rubber, to Fasten to Metal.—This may be done by employing a cement which fastens alike well to the rubber and to the metal or wood. Such cement is prepared by a solution of shellac in ammonia, best made by soaking pulverized gum shellac in ten times its weight of strong ammonia, when a shining mass is obtained, which in three or four weeks will become

liquid without the use of hot water. This softens the rubber, and becomes, after volatilization of the ammonia, hard and impermeable to gases and fluids.

Rubber, to Prepare for Printing on.—Sprinkle the article with farina before vulcanization.

Rubber, to Preserve.—1. Soak in the following: ammonia, 2 oz.; water, 6 oz. See also **Preserving.**

2. Try kerosene.

3. Various articles and instruments made of rubber are apt, with time, to become dry, to crack, grow brittle, and lose their elasticity. Dr. Pol recommends the following simple mixture: Ammonia, 1 part; water, 2 parts; in which the articles should be immersed for a length of time, varying from a few minutes to one-half or one hour, until they resume their former elasticity, smoothness and softness.

4. Very elastic caoutchouc tubing gradually loses some of its elasticity. Later, the tubes break on stretching, even if previously laid in warm water, and finally they crack if pressed between the fingers. This change is put down to a very slow formation of sulphuric acid by the action of moist air on the sulphur contained in the caoutchouc. By frequent washing with slightly alkaline water, the action of the acid is prevented. Tubes washed five or six times a year remain perfectly elastic.

Rubber, to Soften.—1. Use the purified gum rubber, and soften it by contact with hot water or steam, and mould by pressure. Use powdered soapstone to prevent sticking.

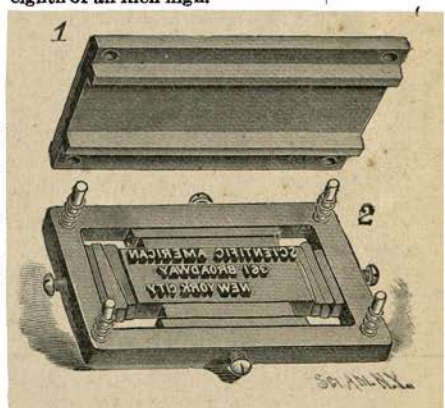
2. For articles of rubber which have become hard and brittle, Dr. Pol's receipt which is given under *Preserving Rubber*, will be found useful. English mackintoshes often lose their elasticity when brought into our climate, soon rendering them of no service. Frequent sponging with water is recommended. If any portion of the cloth leaves the rubber, it should be sent to a rubber manufacturer, as it is extremely difficult to cement.

3. Very often a rubber hose will become hard, but this hardness can be removed by dipping in petroleum and allowing the hose to hang up for a couple of days.

Rubber, Solvent for.—This new solvent consists of a mixture of methylated ether and petroleum spirit—the common benzoline used for burning in sponge lamps. This forms the most rapid and, perhaps, the best solvent; the mixture is as much superior in power to either of its constituents singly as the ether-alcohol is to plain ether in its action on pyroxylin. A very thick solution can be made by dissolving 60 grn. of good India rubber in 2 oz. of benzoline and 1 oz. of sulphuric ether. If the India rubber be cut up fine and the mixture shaken occasionally, the solution will be complete in two or three hours, when it may be diluted to any required strength with benzoline alone. The India rubber should be as light colored as possible, and all the outer oxidized portions must be cut away. Shred the clean India rubber with a pair of scissors, and throw it at once into the solvent.

Rubber Stamps.—The process of making rubber stamps being very simple, and the materials and apparatus for carrying out the process being inexpensive, doubtless many would undertake this branch of business if the details of manufacture were well known. The secrets of rubber stamp making have always been carefully guarded, thus practically limiting the business to those who have learned the trade in the regular way. The instructions given below are based upon the actual practice of the best makers, and written after actual experience in the business.

The tools required for beginning the business are one or more fonts of regular printers' type, one or two chases, some printers' leads, and a small press. The chases are expensive, and as the type is only subjected to a moderate pressure, a cast iron chase may be used instead of one made of wrought iron, and even a wood chase may be made to answer, but this is not recommended. If a wooden chase is resorted to, it should be made from hard wood, such as oak or cherry, of one and one-half inch bars dovetailed together. If ordinary type is used, the chase may be one-half to five-eighths of an inch high. In one side and one end should be inserted two or more screws for clamping the type in the chase. Some printers' wooden furniture will be needed for filling in the chase around the type; leads also are used for this purpose and for spacing between the lines. In each corner of the chase a short three-eighths inch iron rod is inserted. These rods form a guide for the matrix plate, which is perforated to receive them, and between the matrix plate and the rods are placed short spiral springs, as shown in the engraving. These springs are designed to prevent the composition, of which the mould is formed, from coming into contract with the type before the screw of the press is applied. The iron matrix plate is of the same size as the chase, and is provided with two longitudinal ribs. The under surface of the plate, including the ribs, should be planed. The rods which form the guides for the matrix plate must project from the chase at right angles, and must be well fitted to the holes in the plate. The ribs of the matrix plate are one-eighth of an inch high.



Type setting is somewhat difficult for an amateur, but a little practice will soon give proficiency. The type, when set, reads backward, so that if it is desirable to see how the type will appear, a piece of print may be held to the light and viewed from the back side. When the form is made up it is placed in the chase and centered by means of the wooden furniture and leads, the leads being placed next to and between the rows of type. The form should be made up on a flat surface, such as a slab of marble or a level hard wood plank. As soon as the form is locked by means of the screws, the type is planed by laying over it two or three thicknesses of paper, placing on these a smooth flat block, and tapping the block with a mallet. As soon as the surface of the type is leveled, the screws in the chase are again tightened, and the form is ready to receive the impression.

The type is now ready to receive the composition of which the mould is formed. The following is considered the best and most reliable formula for this composition: Finely powdered soapstone, 1 lb. 3 oz.; best dental plaster, 1 lb.; fine powdered China clay (kaolin), 1 lb. These materials are mixed dry, and sifted through a sieve having a fine mesh. A quantity of the composition sufficient to form the mould is placed in a suitable vessel, and mixed with a solution formed by dissolving 5 oz. of dextrine in

1 qt. of hot water. This is to be used cold, and can be prepared in advance. Enough of the dextrine solution is added to the composition to make a thick dough a little stiffer than putty. It should be thoroughly but very quickly mixed and kneaded, and should be smooth and free from lumps. It is to be spread out upon the matrix plate so as to nearly cover the entire space between the longitudinal ribs; then by means of a brass edged ruler, a straight iron bar, or even a table knife, the top of the composition is smoothed and made level, employing the longitudinal ribs of the matrix plate as guides.

When the composition is level with the longitudinal ribs and perfectly smooth, the type is well moistened with benzine, and the matrix plate bearing the coating of composition is placed over the top of the form, the rods before alluded to forming the guides for the plate, and the plate is allowed to rest upon the springs. Then the form, together with the matrix, supported above the type in the manner described, is put in the press, and sufficient pressure is applied to carry the matrix plate down so as to cause the composition to take a perfect impression of the type. The pressure is relieved, and the matrix plate is then removed and allowed to stand for about three minutes, when it is again put on the form above the type, in the manner before described, and then placed a second time in the press and again subjected to pressure, this time using a little more force. The distance to which the type penetrates the composition can be regulated by the printers' leads.

The press used may be purchased from one of the rubber stamp supply houses, or an ordinary letter press may be brought into use, but it is absolutely essential that the plates of the press be parallel. Presses which will answer every purpose can be frequently picked up at the junk shops for a mere trifle. Many substitutes for a press will suggest themselves, but in this, as in anything else, whatever is worth doing is worth doing well; therefore it is advantageous to procure the best tools and appliances on the start.

In any event the press must be capable of standing a heat of 250° F. without warping.

When the matrix is removed from the type the mould should be glossy in every part, and each letter should be clear cut and sharp. Small perforations are now made in the matrix, care being taken to not make them too near the impressions of the type. These are for vents for the escape of moisture. The plate is now heated in an oven for about an hour and a half. The mould is sometimes apt to crack, but this is generally due to too much heat or to a lack of homogeneity in the composition. When the mould is thoroughly dry its face is smoothed with fine sandpaper, and the dust is blown from the letters by means of a bellows.

The rubber used in making stamps is especially prepared by manufacturers for this purpose. It is pure unvulcanized rubber prepared in a special way for vulcanization. Much of the trouble of amateurs in making rubber stamps arises from the use of vulcanized rubber, or of a wrong composition or thickness. The material should be obtained from reliable dealers in rubber stamp materials or from the rubber manufacturers who make a specialty of it. It is purchased in sheets which are readily cut to the required size; they should be a little larger than the impression of the type.

To prevent the adhesion of the rubber to the mould, before the rubber is applied it is thoroughly covered with powdered soapstone, the surplus being rubbed off. The press is heated to about 220° F., the temperature being regulated usually by a thermometer attached to the press, but this may be dispensed with by exercising due care in the process of vulcanization. A pair of Bunsen burners afford a ready means of securing an even and well regulated temperature.

It is well to make a few small stamps first, to see that everything is working right. The rubber is pressed on the matrix; a piece of sheet tin is placed over the rubber; the mould, with the applied rubber, is placed in the warm press, and pressure is gradually applied, thus forcing the rubber into every part of the impression. The time required for vulcanization with a warm press is from three to five minutes; sometimes the time is extended to ten minutes if the press is not sufficiently warm. If the press is overheated, the rubber will be burnt. This is mainly a matter of experience, and can be learned only by actual practice. When the rubber is nearly vulcanized, it has a bluish shade, and if it is pricked with a needle or awl, if the rubber is vulcanized no mark will be left on the removal of the needle; but if it is only semi-vulcanized, the needle will leave a perforation. By occasionally pricking the rubber, the time of exposure to the heat may be roughly determined. A second impression from the mould requires about double the time. When the rubber is vulcanized it is removed from the matrix by an even pull, and a sheet of stamps thus formed is immediately rubbed with powdered soapstone applied by means of a brush. The different stamps are then cut apart with scissors and mounted on a handle by means of shellac varnish.

A good ink for rubber stamps is made by using 1 oz. of methyl violet (extra 3 B) in 1 qt. of hot glycerine. For the pad, use a piece of felt or cloth saturated with the ink and covered with a piece of silk.

Rubber Stamps, Ink for. See **Inks.**

Rubber Tubing.—Hose, etc., to soften.—Draw through petroleum and hang up to dry.

Rubber, Varnish for. See **Varnishes.**

Rubber, to Vulcanize.—Parkes' method is now sometimes adopted. The caoutchouc is immersed in a mixture of 30 parts of bisulphide of carbon and 1 part of chloride of sulphur. It is next placed in a room heated to 70° Fah., and when all the sulphide of carbon has been volatilized, the process is so far complete that it is only requisite to boil the material in a solution of about 18 oz. of caustic potassa to 2 gal. of water, the vulcanized caoutchouc being next washed to remove excess of alkali. See also *Rubber Stamp* making above.

Rupert's Drops. See **Glass.**

Ruling Ink. See **Inks.**

Russet Shoes, Dressing for. See **Shoes,** *Tan Dressing for.*

Rust. See also **Incrustations.**

First come receipts for rust preventives, then receipts for rust on iron and steel, followed by the removal of rust and miscellaneous rust receipts.

Rust Preventives. — The following recipes are recommended for preventing rust on iron and steel surfaces.—*Mechanics' Own Book.*

1. Caoutchouc oil is said to have proved efficient in preventing rust, and to have been adopted by the German army. It only requires to be spread with a piece of flannel in a very thin layer over the metallic surface and allowed to dry up. Such a coating will afford security against all atmospheric influences and will not show any cracks under the microscope after a year's standing. To remove it, the article has simply to be treated with caoutchouc oil again, and washed after twelve to twenty-four hours.

2. A solution of India rubber in benzine has been used for years as a coating for steel, iron and lead, and has been found a simple means of keeping them from oxidizing. It can be easily applied with a brush and is as easily rubbed off. It should be made about the consistency of cream.

3. All steel articles can be perfectly preserved from rust by putting a lump of freshly burnt lime in the drawer or case in which they are kept. If the things are to be moved (as a gun in its case, for instance), put the lime in a muslin bag. This is especially valuable for specimens of iron when fractured, for in a moderately dry place the lime will not want renewing for many years, as it is capable of absorbing a large quantity of moisture. Articles in use should be placed in a box nearly filled with thoroughly pulverized slaked lime. Before using them rub well with a woolen cloth.

4. The following mixture forms an excellent brown coating for protecting iron and steel from rust: Dissolve 2 parts crystallized iron chloride, 2 parts antimony chloride and 1 part tannin, in 4 parts water and apply with a sponge or rag and let dry. Then another coat of the paint is applied, and again another, if necessary, until the color becomes as dark as desired. When dry, it is washed with water, allowed to dry again, and the surface polished with boiled linseed oil. The antimony chloride must be as nearly neutral as possible.

5. To keep tools from rusting, take ½ oz. camphor, dissolve in 1 lb. melted lard; take off the scum and mix in as much fine black lead (graphite) as will give it an iron color. Clean the tools and smear with this mixture. After twenty-four hours rub clean with a soft linen cloth. The tools will keep clean for months under ordinary circumstances.

6. Put about 1 qt. fresh slaked lime, ½ lb. washing soda, ½ lb. soft soap in a bucket; add sufficient water to cover the articles; put in the tools as soon as possible after use, and wipe them up next morning, or let them remain until wanted.

7. Soft soap, with about half its weight of pearlash; 1 oz. of the mixture in about 1 gal. boiling water. This is in every day use in most engineers' shops in the drip cans used for turning long articles bright in wrought iron and steel. The work, though constantly moist, does not rust, and bright nuts are immersed in it for days till wanted, and retain their polish.

8. Melt slowly together 6 or 8 oz. lard to 1 oz. rosin, stirring till cool; when it is semi-fluid, it is ready for use. If too thick, it may be further let down by coal oil or benzine. Rubbed on bright surfaces ever so thinly, it preserves the polish effectually, and may be readily rubbed off.

9. To protect metals from oxidation—polished iron or steel, for instance—the requisite is to exclude air and moisture from the actual metallic surface; wherefore, polished tools are usually kept in wrappings of oiled cloth and brown paper; and, thus protected, they will preserve a spotless face for an unlimited time. When these metals come to be of necessity exposed, in being converted to use, it is necessary to protect them by means of some permanent dressing; and boiled linseed oil, which forms a lasting film of covering as it dries on, is one of the best preservatives, if not the best. But in order to give it body, it should be thickened by the addition of some pigment, and the very best—because the most congenial—of pigments is the ground oxide of the same metal—or, in plain words, rusted iron reduced to an impalpable powder, for the dressing of iron or steel—which thus forms the pigment of red oxide paint.

10. Slake a piece of quicklime with just water enough to cause it to crumble, in a covered pot, and while hot add tallow to it and work into a paste and use this to cover over bright work; it can be easily wiped off.

11. Olmstead's varnish is made by melting 2 oz. rosin in 1 lb. fresh sweet lard, melting the rosin first and then adding the lard and mixing thoroughly. This is applied to the metal, which should be warm if possible and perfectly cleaned; it is afterward rubbed off. This has been well proved and tested for many years and is particularly well suited for planished and Russian iron surfaces, which a slight rust is apt to injure very seriously.

12. Use ferroline or white zapon lacquer.

Rust Removers.—1. Cover the metal with sweet oil well rubbed in and allow to stand for forty-eight hours; smear with oil applied freely with a feather or piece of cotton wool, after rubbing the steel. Then rub with unslaked lime reduced to as fine a powder as possible.

2. Immerse the article to be cleaned for a few minutes until all dirt and rust is taken off, in a strong solution of potassium cyanide, say about ½ oz. in a wineglassful of water; take out and clean it with a tooth brush with some paste composed of potassium cyanide, Castile soap, whiting and water, mixed into a paste of about the consistence of thick cream.

Iron and Steel, to Prevent the Rusting of.—1. Mix whiting and linseed oil together to form a paste. Put a coat on the iron. It is easily removed, and will prevent rusting.

2. Thick lubricating petroleum, or solid paraffin applied to the slightly warmed iron, is one of the best preservatives; in some cases a transparent varnish of copal or shellac is preferable. The main point is to clean the iron properly before the application from all traces of rust, by means of brushing and a mineral acid, to wash it well, and to neutralize all remaining traces of acid, with potash lye, or with lime or some other alkali; then clean and dry thoroughly, and apply your oil, paraffin or varnish.

3. Boiled linseed oil will keep polished tools from rusting if it is allowed to dry on them. Common sperm oil will prevent them from rusting for a short period. A coat of copal varnish is frequently applied to polished tools exposed to the weather. Woolen materials are the best for wrappers for metals.

4. Iron and steel goods of all descriptions are kept free from rust by the following: Dissolve ½ oz. of camphor in 1 lb. of hog's lard, take off the scum, and mix as much black lead as will give the mixture an iron color. Iron and steel and machinery of all kinds, rubbed over with this mixture, and left with it on for twenty-four hours, and then rubbed with a linen cloth, will keep clean for months. If the machinery is for exportation, it should be kept thickly coated with this during the voyage.

5. Antimony chloride, 9 parts; crystallized iron chloride, 9 parts; 4½ parts tannin in 18 parts water. Apply with a sponge or rag, let it dry, apply again if necessary. This mixture forms a brown coating on the article. When dry, wash with water; let it dry, then polish with boiling linseed oil.

6. A compound of grease and zinc filings is found to be an excellent preventative against rust for iron bolts inserted in wood. It is used to line the bolt hole.

7. A correspondent sends us the following suggestions: "I have tried many things, but found nothing better than boiled linseed oil to protect instruments and tools (files, saws, guns, etc.) from rusting. It even works best with a kettle used for heating water for bathing. Wipe the metal with a cloth dipped in the oil and let it dry, which will require only a few minutes. If it is unnecessary to have the iron bright and shining, you need not scour it before the application of the oil; this will combine with the rust and form a firm, durable coating.

8. Rub over with a mixture of tallow or lard and thick white lead paint.

9. To keep iron goods of any kind, and especially those parts of machines which are made of steel or iron, from rusting, take ½ oz. of powdered camphor and melt it before the fire in 1 lb. of good lard. To give it a dark color, add as much fine black lead as is necessary to produce the desired effect. Clean the ironwork and smear it over with this preparation. After

this it should be allowed to remain untouched for twenty-four hours, when the grease should be removed by wiping the ironwork with a soft cloth.

10. Vaseline is an excellent preservative. Buy by the can and apply with a brush.

Rusting, to Prevent Iron from, Underground.—Cottonseed or linseed oils, 1 lb.; coal tar, 1 lb.; sulphur, 1 lb.; heat separately; mix thoroughly and heat to 300° F. for about one hour, at the end of which it becomes pasty. Heat the metal to which it is applied.

For Preserving the Polish on Bright Surfaces.—1. Take 2¼ oz resin; from 15 to 20 oz. lard. Melt slowly together, stirring until cool. The mixture is used when semi-fluid. It may be thinned by coal oil or benzine. Put on a bright surfaces, even thinly; it will preserve the polish, and it can be readily rubbed off.

2. Gutta percha, 8 lb.; mutton suet, 16 lb.; beef suet, 24 lb.; neatsfoot oil, 1½ gal.; rape oil, ¾ gal. Melt, and dissolve thoroughly; color with a little rose pink; add oil of thyme or other perfume. When cold, rub on the surface of bright steel, iron, brass, or other metal requiring protection from rust.

Screws, Prevention of Rusting-in of.—Dip the screws in a thin paste, made of graphite and oil, before screwing them in place.

Steel Wire, to Protect from Rust.—Try the following: Dissolve ½ oz. camphor in 2 oz. 90% alcohol, and mix this with 2 pt. fine sperm oil. Allow the wire to remain in contact with this mixture, heated to 180° F., for half an hour; then rub off excess with a soft cotton cloth.

To Keep Small Steel Instruments from Rusting.—1. Clean frequently; after using clean with dry chamois leather and wipe off with an oiled rag.

2. For this purpose the *Lancet* confidently recommends a mixture of equal parts of carbolic acid and olive oil, smeared over the surface of the instruments. This plan is much used by medical officers in the navy, and is found to preserve the polish and brightness of the steel, however moist and warm the climate may be.

Stoves from Rusting, to Prevent.—Apply kerosene with a cloth. This will prevent stoves from rusting during the summer. Also an excellent material to apply to all iron tools used about a farm.

Tools from Rusting, to Keep.—Put ¼ lb. of soft soap in a pail, and add 1 pt. freshly slaked lime; sufficient water to cover the articles. Place the tools in this mixture as soon as possible after they are used. Wipe them the next morning.

Apparatus for Coating Laboratory Tools.—Metallic tools and other articles, particularly those consisting of iron or steel, which are used in laboratories or other workshops where acid vapors are of frequent occurrence, may be protected from rust with a black shining coat, which resists acids and is but little affected even by a low red heat, in the following manner. Have a sheet iron box large enough to hold all the tools, etc., to be coated, and provided with a false bottom of wire netting. Underneath this is placed a layer of crushed coal (blacksmith's coal), about 1 centimeter deep; then place the tools, which must be entirely free from rust, clean and polished, upon the wire net. The box is then covered and set on a strong fire, which causes the coal to give off tarry constituents, and the heat continued until the bottom of the box is at a red heat. When all evolution of gas has ceased, the box is allowed to become cold, and the tools are taken out, and will be found covered with a beautiful glossy coat. Tongs, shears, pincers, etc., so coated, keep in good condition for months, even in places where the air is constantly mixed with acid vapors.—*Dr. Arendt.*

Rust, to Remove.—Iron articles thickly coated with rust may be cleaned by allowing them to remain in a nearly saturated solution of chloride of tin, from 12 to 14 hours.

2. Extracting Rust from Steel.—Immerse the article to be cleaned for a few minutes until all dirt and rust is taken off in a strong solution of cyanide of potassium, say about ½ oz. in a wineglassful of water; take out and clean it with a toothbrush, with some paste composed of cyanide of potassium, Castile soap, whitening and water; these last are mixed in a paste about the consistence of thick cream.

3. To remove rust from small hollow castings, dip in dilute sulphuric acid (1 part commercial acid to 10 of water). Wash in hot lime water and dry in a tumbler in dry sawdust.

4. Immerse the articles in kerosene oil; allow them to remain for some time. This will loosen the rust so it will come off easily.

5. To remove rust from steel, cover the metal with sweet oil well rubbed in; forty-eight hours after rub with finely pulverized unslaked lime.

Anti-Rust.—Camphor, ½ oz.; dissolve in melted lard, 1 lb.; take off the scum and mix in as much black lead as will give it an iron color; clean machinery, and smear with compound; after twenty-four hours remove with soft linen cloth.

Barff's Process.—A patented process employed for the protection of the surfaces of iron from rust, effected by artificially coating them with a film of magnetic oxide. The iron is first heated to redness and steam passed over it. The iron decomposes the steam, liberating oxygen, which latter immediately attacks the iron, forming magnetic or black oxide, Fe_3O_4.

Drawing Instruments, Removing Rust from.—1. Use fine emery paper and crocus cloth.

2. Mix 10 parts of tin putty, 8 of prepared buck's horn and 25 of 90% alcohol to a paste. Cleanse the articles with this, and finally rub with soft blotting paper.

Grease for Anointing Gun Barrels, to Prevent Rust.—Make an ointment of corrosive sublimate and lard. It is said that this will protect gun barrels from rust, on the seashore.

Nickel Plated Articles, to Remove the Rust from.—Cover the stains with oil or grease for a few days and then remove the rust by rubbing with a little ammonia. If this does not remove the rust, try very dilute hydrochloric acid. When dry polish with tripoli or whiting.

Rust Cement. See **Cements.**

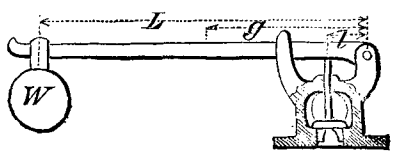
Sachet Powders. See **Powders.**

Sack.—(From *sec*, dry.) A wine used by our ancestors, supposed by some to have been Rhenish or canary, but, with more probability, by others to have been dry mountain or "vin d'Espagne, vin sec;" (Howell, Fr. and Eng. Dict., 1650.) Falstaff calls it "sherris sack," (sherry sack), from Xeres, a sea town of Corduba, where that kind of sack (wine) is made.—*Blount.*

Saddening.—Making a color darker by means of a salt of iron.

Safes, Filling for Fireproof.—Plaster of Paris or alum, being non-conductors of heat, is recommended as a filling.

Safety Matches. See **Matches.**



Safety Valve.—*Formulas for Computing the Elements of Safety Valve.*—

Let W=the weight.
" L=distance between center of weight and fulcrum in inches.
" w=weight of lever in pounds.
" g=distance between center of gravity of lever and fulcrum in inches.
" l=distance between center of valve and fulcrum in inches.
" V=weight of valve and spindle.
" A=area of valve in square inches.
" P=pressure at which the valve is to blow off, per square inch.

Then the weight required to balance a given pressure at any *given* distance on the lever will be by the formula:

$$W=\left\{(P\times A)-\left(V+\frac{(w\times g)}{l}\right)\right\}\times\frac{l}{L}$$

When the weight is at hand and known, and the distance is required, then

$$L=\left\{(P\times A)-\left(V+\frac{(w\times g)}{l}\right)\right\}\times\frac{l}{W}$$

The elements between the brackets to be computed first. To obtain the area of the valve, multiply the square of the diameter by 0·7854.

Sage Tea.—Take—

Dried leaves of sage	½ oz.
Boiling water	1 qt.

Infuse for half an hour, and then strain. Sugar and lemon juice may be added in the proportion required by the patient. In the same manner may be made balm and other teas.

These infusions form very agreeable and useful drinks in fever, and their diaphoretic powers may be increased by the additon of the sweet spirits of niter or antimonial wine.

Salad Dressing.—See also Mayonnaise.—This is excellent both for salad and for sliced *tomatoes* in summer. Take the yelk of 1 fresh egg and mix it with 2 tablespoonfuls of olive oil very slowly, add 1½ spoonfuls of mustard, 3 spoonfuls of salt, a little pepper, and last of all, 2 spoonfuls of vinegar. Beat the white of the egg to a stiff froth, and lightly stir in.

Salicylic Acid.—1. Meat, poultry and game—in hot weather—although apparently quite fresh, often prove to be slightly tainted and of bad smell. Such condition can be entirely remedied, either by watering and washing the meat, etc., in a lukewarm solution of salicylic acid (3 to 4 teaspoonfuls of the acid to 1 quart of water), or by adding a small pinch of the dry acid during cooking, in the case of boiling the meat. To protect meat, etc., for several days against becoming high or tainted: Place it for 20 or 30 minutes into an aqueous solution of 8 drm. of acid (10 teaspoonfuls) to 1 gallon of water.

2. Rub the surface of the meat, etc., with dry salicylic acid, particularly about the bony and fatty parts, the meat to be cleaned before cooking. Although the raw meat treated with the acid turns slightly pale on the surface, the interior does not undergo any change whatever. Meat treated with the acid requires less cooking to render it tender.

3. Fish can also be preserved in a similar manner.

4. Pure Milk.—A third of a teaspoonful (or, if the temperature be high, a little more) of the solid acid per quart delays the curdling of the milk for 36 hours without interfering with its yielding cream.

5. Butter washed with an aqueous solution (4 drm.=5 teaspoonfuls of acid to a gallon of water), or kept in it or wrapped in cloths soaked in this water, keeps fresh for a very long time. Butter already rancid can be improved by a thorough washing and kneading with a stronger solution (8 drm. = 10 teaspoonfuls of acid per gallon of tepid water), followed by washing in pure cold water. The bad smell often arising in salted butter is entirely prevented by such an admixture of the acid.

6. Jams of all kinds, jellies, juice, pickles, etc., treated in the usual way, but with the addition of about 1 drm. (or 1 teaspoonful) of acid to 4 pounds, will keep sound with absolute certainty for an indefinite time, fermentation and spoiling being thus averted. Under exceptionally unfavorable circumstances, such as hot pantries, a little dry acid must, besides, be sprinkled on the surface underneath the cover of the vessel or pot.

7. Beer.—An addition of ½ oz. (10 teaspoonfuls) to about 36 gallons of beer will keep it from turning sour.

8. Wine.—One-quarter oz. (5 teaspoonfuls) to about 36 gallons of wine—say a pinch per bottle—will prevent deterioration.

9. New-laid eggs can be kept unaltered for a long time by being placed for half an hour into a cold saturated aqueous solution (8 teaspoonfuls of the acid to a gallon of water), then allowed to dry in the air, and, as usual, stored in an airy, cool, and dry place.

10. Cheese, washed with the solution and dried, will not turn mouldy and gray on the outside. Vessels, corks, etc., are very well cleaned and disinfected by being washed with an aqueous solution of the acid. This deserves special notice. Caution.—By any contact with metal, especially with iron, the salicylic acid will turn violet.

Salts. See also **Cheltenham** and **Epsom.**

List of Names given in the Older Language of Chemistry to Various Compounds.—

Old Name.	Modern Name.
Salt (ammoniacal, fixed)	Calcium chloride.
" (ammoniacal, secret) of Glauber	Ammonium sulphate.
" (arsenical, neutral) of Macqueer	Potassium hydrogen arsenate.
" (bitter, cathartic)	Magnesium sulphate.
" (common)	Sodium chloride.
" (digestive) of Sylvius	Potassium acetate.
" (diuretic)	Potassium acetate.
" (Epsom)	Magnesium sulphate.
" (febrifuge) of Sylvius	Potassium chloride.
" (fusible)	Ammonium phosphate.
" (fusible) of urine	Sodium ammonium phosphate.
" (Glauber's)	Sodium sulphate.
" (marine)	Sodium chloride.
" (marine, argillaceous)	Aluminum chloride.
" (microcosmic)	Sodium ammonium phosphate.
" (nitrous ammoniacal)	Ammonium nitrate.
" of amber	Succinic acid.
" of benzoin	Benzoic acid.
" of canal	Magnesium sulphate.
" of colcothar	Ferrosum sulphate.
" of egra	Magnesium sulphate.
" of lemons (essential)	Potassium hydrogen oxalate.
" of saturn	Lead acetate.
" of seidlitz	Magnesium sulphate.
" of seignette	Sodium potassium tartrate.
" of soda	Sodium carbonate.
" of sorrel	Potassium hydrogen oxalate.
" of tartar	Po assium carbonate.
" of vitriol	Zinc sulphate.
" of wisdom	Ammonio mercury chloride.
" (perlate)	Disodium phosphate.
" (polychrest of Glaser)	Potassium sulphate.
" (sedative)	Boric acid.
" (spirit of)	Hydrochloric acid.
" (sulphureous) of Stahl	Potassium sulphite.
" (wonderful)	Sodium sulphate.
" (wonderful, perlate)	Disodium phosphate.

Calcareous Salts.—Temperatures at which they are deposited.—The temperatures at which calcareous matters are precipitated in boiler waters are as follows:

Carbonates of lime, between....176° and 248° F.
Sulphates of lime, between....284° and 424° F.
Chlorides of magnesium, between....212° and 257° F.
Chlorides of sodium, between...324° and 364° F.

In order to free water from these salts, it must consequently be heated to the above temperatures.

Salt, Pink (Double Chloride of Tin and Ammonium).—This salt is a compound of bichloride of tin (perchloride) and sal ammoniac, or chloride of ammonium. It contains when pure, 70 parts bichloride of tin to 30 parts sal ammoniac. It is soluble in three times its weight of water at 60° F. If boiled in a state of concentrated solution, it is not decomposed; but if dilute, the whole of the tin is deposited in the form of flakes of oxide. It is very valuable as a solvent for organic coloring matters, and is used both in printing and dyeing.

Salts, Preston.—Composed of ammonium chloride and freshly slaked lime. When the bottles are filled with this compound, rammed in very hard, a drop or two of very cheap otto is poured in the top before corking.

Eau de Luce.—Tincture of benzoin, or tincture of balsam of Peru, 1 oz.; otto of lavender, 10 drops; oil of amber, 5 drops; ammonia, 2 oz.

Salts, Smelling.—

1. Carbonate of ammonia (crushed small) ..... 1 lb.
Oil of lavender (Mitcham) .... 1 fl. oz.
Oil of bergamot..... 1 fl. oz.
Oil of cloves ..... 2 fl. drm.
Oil of cassia..... 1 fl. drm.

Rub them thoroughly together, sublime at a very gentle heat, into a well cooled receiver, and at once put the product into a well stoppered bottle, or bottles. The sublimation may be omitted, but the quality of the product suffers. This is varied, in some samples, by substituting 1 oz. of oil of lemon, or a little of the oils of rosemary and sweet flag (calamus aromaticus), for the oils of cloves and cassia; or by adding (after sublimation) a dash (2 or 3 drops per bottle) of essence of musk or essence royale.

2. As before, but taking, as perfume—
Oil of bergamot ..... 2 fl. oz.
Oil of verbena..... ½ fl. oz.
Otto of roses..... 1 to 2 drm.
It is varied as No. 1.

3. As No. 1, but using—
Oil of bergamot ..... ¾ fl. oz.
Oil of lemon ..... ¾ fl. oz.
Essence de petit grain..... 3 fl. drm.
Oil of cloves ..... 1 fl. drm.
Oil of cassia..... 1 fl. drm.
Varied, as before, at will.

Inexhaustible Salts.—Liquid ammonia, 1 pt.; otto of rosemary, 1 drm.; otto English lavender, 1 drm.; otto of bergamot, ½ drm.; otto of cloves, ½ drm. Mix the whole together with agitation in a very strong and well stoppered bottle.

Salves.—*Lip Salve.*—1.
Spermaceti..... 40 parts.
Lard perfectly pure and fresh...80 parts.
White wax..... 20 parts.
Oil of sweet almonds .....5 to 10 parts.

According to the season of the year, are melted together, the mixture colored with a sufficient quantity of alkanet, by digesting the root with the melted mass, and the latter then suitably perfumed, for instance, with—
Oil bergamot..... 2 parts.
Oil orange..... 3 parts.

The mass is then poured out into moulds. It is customary to pour it into tin tubes, from which it is removed when cold, and then covered with tin foil.

2. Take of—
Spermaceti..... 1 oz.
Yellow wax..... ½ oz.
Oil of almonds..... 2 oz.
Oil of rose..... 12 drops.

Melt with gentle heat, add alkanet root, q. s., to color, then strain, and lastly add the oil of rose.

3. *Lip Salve in Sticks.*—
Paraffin ..... 6 drm.
Cocoa butter..... 6 drm.
White vaseline..... 1 oz.
Eosin..... 1 grn.
Otto of rose..... 5 drops.

Melt the solids and add the vaseline. Dissolve the eosin in sufficient alcohol, and add to the mixture, also the perfume, and cast into suitable sized sticks.—*Zeit. Apoth. Verein.*

4. Cerat d'Amour (for the lips).—
Spermaceti..... 2 oz.
Oil of sweet almonds ..... 4 oz.
Milk of roses..... 1 drm.
Powdered roses..... 3 drm.

Manipulate after the usual method.

5. Salve for Chapped Lips and Hands.—Take 2 oz. white wax, 1 oz. of spermaceti, 4 oz. of oil of almonds, 2 oz. of honey, ¼ oz. of essence of bergamot, or any other scent. Melt the wax and spermaceti; then add the honey, and melt all together, and when hot, add the almond oil by degrees, stirring it till cold.

6. Coral Lip Salves.—
White wax..... 70 grm.
Vaseline ..... 100 grm.
Alkannin..... 0·25 grm.
Essential oil lemon..... 1 grm.
Essential oil bergamot..... 1 grm.
Essential oil of roses ..... 0·5 grm.

7. Olive oil benzoated..... 500 grm.
White wax..... 300 grm.
Cetacei..... 30 grm.
Alkannin..... 1 grm.
Essential oil jasmin..... 5 grm.
Essential oil of roses..... 3 drops

8. Camphor Cerate.—Take—
Olive oil..... ½ lb.
White wax (pure)..... ¼ lb.
Spermaceti..... 2 oz.
Camphor ..... ½ oz.

Mix, as directed under camphor balls. Used as an application to chaps, chilblains, abrasions, excoriations, etc.; also as lip salve in cold weather, as a hair cosmetic, and as a mild, stimulating and anodyne friction.

9. Fisher's Lip Salve.—
White wax..... 2 oz.
Lard..... 2 oz.
Spermaceti..... ½ oz.
Oil of sweet almonds..... 1 oz.
Balsam of Peru ..... ¼ oz.
White sugar..... ½ oz.
Raisins..... 6 oz.

Let the mixture simmer for two hours in a covered vessel, and then strain through linen.

10. Crême de Psyché (for the lips).—
White wax ..... 1 oz.
Spermaceti..... 1 oz.
Oil of sweet almonds..... 5 oz.
Mecca balsam..... 1 drm.
Pulverized acetate of lead..... ½ drm.

Prepare as for the pommade rosat, and add, while the mixture is warm, the balsam, and when it is cooled, the sugar of lead.

11. Peruvian Lip Salve.—
Spermaceti ointment..... ½ lb.
Alkanet root..... 3 or 4 drm.

Digest, at a gentle heat, until the first has acquired a rich, deep red color, then pass it

through a coarse strainer. When the liquid fat has cooled a little, well stir in, of—

Balsam of Peru..... 3 drm.

In a few minutes pour off the clear portion from the dregs, if any, and add, of—

Oil of cloves..... .....20 to 30 drops.

Lastly, before it cools, pour it into the pots or boxes. The product forms the finest and most esteemed lip salve of the shops. Two or 8 drops of essence of ambergris, or of essence royale, improve and vary it.

12. Rose Lip Salve.—As the above, but using only 1½ drm. of balsam of Peru, and replacing the oil of cloves with a few drops of otto of roses, or sufficient to give the mixture a marked odor of roses. Some makers omit the balsam altogether. If uncolored, it forms white (rose) lip salve.

13. White Lip Salve.—

Spermaceti ointment ..... ½ lb.

Liquefy it by the heat of warm water, and stir in of—

Neroli or essence de petit grain.. ½ drm.

as before.

14. Fine Rose Lip Salve.—Almond oil, ½ lb.; spermaceti and wax, each 2 oz.; alkanet root, 2 oz.; otto of roses, ¼ oz. Place the wax, spermaceti oil, and alkanet root into a vessel heated by steam or water bath. After the materials are melted, they must digest on the alkanet root, to extract its color, for at least four or five hours; finally strain through fine muslin, then add the perfume just before it cools.

Sandarach, or Sandarac.—Juniper resin. It occurs in small yellow drops, easily fusible in alcohol. It is largely used in making varnishes and lacquers. It is obtained from the African *arbor vitæ*.

Sand Belts, to Cement.—There is no cement that is equal to the best glue for sand belts. Common glue is poor stuff for any use. Use only the best quality of light brown glue, and select it yourself. By bending a few pieces in your hands, the weak, brittle glue will break easy and fly; the strong, tough glue will bend with difficulty, and finally splinter and not fly into pieces.

Sand, Colored.—The coarser particles are sifted out from fine white sand, and it is colored in the following way: 1. Blue.—Sand, 159 parts; Berlin blue, 6 parts. Boil, stirring constantly. When the sand is colored take out and dry.

2. Rose Colored Sand.—150 parts white sand; 6 parts vermilion. Mix thoroughly.

3. Dark Brown Sand.—White sand boiled in a decoction of Brazil wood, then dried over heat.

4. Black Sand.—Fine quartz sand (freed from dust by sifting), ½ lb.; add to this 8 to 12 spoons of fat. Heat the sand before adding the fat, and continue the heat until there is no smoke or flame on stirring. Wash and dry.

Sand Parting.—Burnt sand scraped from the surface of castings.

Sandstone, Cement for. See **Cements.**

Sangaree.—One-third of wine in water with sugar and nutmeg to the taste.

Frozen.—Nothing can be more refreshing at the dinner table in hot weather than claret or port wine made into sangaree with proportions of water, sugar and nutmeg as taste shall direct, then frozen, with the addition of a few whites of egg beaten to a froth. Send to table exactly as you would Roman punch.

Sanitary Hints.—1. Remember that pure air is food, and that polluted air is poison.

2. Never allow the air to stagnate in your rooms or houses.

3. Provide for the constant ventilation of your rooms. One of the best ways of doing this is keeping the window a little down from the top.

4. Keep the vent always open.

5. Thoroughly air all sleeping apartments, beds, and bed clothes during the day.

6. Do not use, for drinking or cooking, water which has long lain stagnant in cisterns or vessels.

7. See that the water cistern is cleaned out regularly, say every month or two.

8. See that there is no connection between the water cistern and the drain, and that the waste goes to the outside of the house.

9. Do everything in your power to keep closets and sinks cleanly and sweet.

10. See that the private drains from closets are ventilated by pipe opening at the roof.

11. See that the private drains from closet and sinks are properly trapped, in order that the poisonous gases from the sewers may not get into the house.

12. The neglect of this precaution is a fruitful cause for many of the worse diseases, such as diphtheria, typhoid fever, etc.

13. When you need to use disinfectants, as after fever, etc., remember that they do not radically cure the evil. The only remedy is the removal of the causes of impure air or water which have produced the evil.

14. Avoid the use of covered (or press) beds, the most wholesome being a plain iron bed without any curtains.

15. In a case of sickness all utensils, etc., should be kept scrupulously clean, and the precautions suggested above as to maintaining a supply of pure air should be observed with redoubled vigilance.

Sarsaparilla.—

1. Sassafras bark bruised.....	1	lb.
Licorice root bruised.....	7	oz.
Water.....	2½	gal.
Oil of sassafras	1½	drm.
Oil of wintergreen	2	drm.
Alcohol, 95%.....	2	oz.

Boil the sassafras and licorice in the water half an hour. Strain through flannel, then add the sirup. Dissolve the oils in the alcohol, and add them to the sirup. Agitate the mixture freely.

2. *Ayer's.*—Ayer's formula for making sarsaparilla.—

Fluid extract of sarsaparilla. .	3	oz.
Fluid extract stillingia.....	3	oz.
Fluid extract yellow dock.....	2	oz.
Fluid extract May apple.....	2	oz.
Sugar	1	oz.
Potassium iodide.	1.90	grn.
Iron iodide.....	10	grn.

Mix them.

Sarsaparilla, Extracts and Essences of. See **Extracts** and **Essences.**

Sarsaparilla Mead.—Boil ½ lb. of Spanish sarsaparilla four or five hours; strain off 1 gal. Add 8 lb. sugar, 5 oz. tartaric acid.

Saturation.—A term used by chemists to express the condition of a body when it has taken up as much of a substance as it will hold (chemically) or be combined with. Substances vary greatly as regards their solubility, thus sugar is very soluble, while mercury bichloride is only sparingly soluble. Water is the great solvent, and when heated its dissolving power is greatly increased.

Sauces.—1. Anchovy.—Three or 4 anchovies chopped; butter, 3 or 4 oz.; water, 2 oz.; vinegar, 2 tablespoonfuls; flour, 1 tablespoonful; stir over the fire till it thickens, then rub it through a coarse hair sieve.

2. Chetney Quihi.—Sharp apples pared and cored, tomatoes, salt, brown sugar and raisins, of each 8 oz.; red chillies and powdered ginger, of each 4 oz.; garlic and shallots, of each 2 oz.; pound well, add vinegar 6 qt. and lemon juice 1 qt.; digest with frequent agitation for a month, pour off nearly all the liquor and bottle. Used for fish or meat, either hot or cold, or to flavor

stews, etc. The residue is the chetney, and must be put into pots or jars. It is used like mustard.

3. Fish.—*a.* Port wine, 1 gal.; mountain, 1 qt.; walnut ketchup, 2 qt.; anchovies and liquor, 2 lb.; 8 lemons; 36 shallots; scraped horseradish, 1½ lb.; flour of mustard, 8 oz.; mace, 1 oz.; cayenne, q. s.; boil up gently, strain and bottle.

b. Twenty-four anchovies, 10 shallots; scraped horseradish, 3 spoonfuls; mace and cloves, of each ¼ oz.; 2 sliced lemons; anchovy liquor, 8 oz.; water, 1 pt.; Hock or Rhenish wine, 1 bottle; walnut ketchup, ½ pt.; boil to 2½ lb., strain and bottle.

4. Quin's.—*a.* Walnut pickle and port wine, of each, 1 pt.; mushroom ketchup, 1 qt.; anchovies and shallots, chopped, of each 2 doz.; soy, ½ pt.; cayenne, ¼ oz.; simmer for ten minutes, strain and bottle.

b. Walnut pickle, mushroom ketchup and soy, of each 1 pt.; chopped cloves of garlic and anchovies, of each 1 doz.; cayenne and bruised cloves, of each 1 drm. As last.

5. Sauce Superlative.—Port wine and mushroom ketchup, of each 1 qt.; walnut pickle, 1 pt.; pounded anchovies, ½ lb.; lemon peel, minced shallots and scraped horseradish, of each 2 oz.; allspice and black pepper, bruised, of each 1 oz.; Cayenne pepper and bruised celery seed, of each ¼ oz. (or currie powder ¾ oz.); digest fourteen days, strain and bottle.

6. Tomato.—Bruised tomatoes, 1 gal.; salt, ½ lb.; in three days press out the juice; to each quart add shallots, 2 oz.; black pepper, 1 drm.; boil for thirty minutes, strain, add mace, allspice, ginger and nutmeg, of each ¼ oz.; coriander seed and cochineal, of each 1 drm.; simmer gently for fifteen minutes, strain, cool and bottle.

7. Sauce Aristocratique.—Green walnut juice, anchovies, equal parts; cloves, mace and pimento, bruised; of each 1 drm. to every pound of juice; boil and strain; then to every pint add 1 pt. vinegar, ½ pt. of port wine, ¼ pt. of soy, and a few shallots. Let the whole stand for a few days and decant the clear liquor.

8. Sauce au Roi.—Brown vinegar (good), 3 qt.; soy and walnut ketchup, of each ¼ pt.; cloves and shallots, of each ½ doz.; Cayenne pepper, 1 oz.; mix and let them stand for fourteen days.

9. Sauce Piquante.—Soy, 1 part; port wine and Cayenne, of each 2 parts; brown vinegar 16 parts; mix and let them stand for three or four days before bottling.

10. Soy.—Boil until soft 2 qt. of the seeds of Dolichos soja (if this cannot be obtained use haricot or kidney beans). Add 2 qt. bruised wheat; keep in a warm place for one day; add 2 qt. salt and 1 gal. of water. Keep for two or three months in a tightly covered stone jar. Then press out the liquor. The genuine soy is imported from China, but this is a good substitute.

Italian Tamara.—Coriander seed, 10 oz.; cloves and cinnamon, of each 10 oz.; anise seed, 5 lb.; fennel seed, 5 lb. Mix.

To make Quin Sauce.—Walnut catsup, 2½ gal.; mushroom catsup, 2½ gal.; soy, 1½ gal.; garlic, 1¼ lb.; sprats, 7½ lb. Boil 15 minutes, strain and bottle.

Harvey's Sauce.—Quin sauce, 24 parts; soy, 8 parts; cayenne, ½ part.

Epicurean Sauce.—Indian soy, 3 oz.; walnut catsup, 12 oz.; mushroom catsup, 12 oz.; port wine, 3 oz.; bruised white pepper, ¾ oz.; shallots, 4½ oz.; cayenne, ⅜ oz.; cloves, ¾ oz. Macerate for 2 weeks in a warm place, strain and add white wine vinegar to make 1½ pt.

Worcestershire Sauce.—This is quite a complex condiment. It is made of wine vinegar, 1½ gal; walnut catsup, 1 gal.; mushroom catsup, 1 gal.; Madeira wine, ½ gal.; Canton soy, ½ gal.; moist sugar, 2½ lb.; salt, 19 oz.; powdered capsicum, 3 oz.; pimento, 1½ oz.; coriander, 1½ oz.; chetney, 1½ oz.; cloves, ¾ oz.; mace, ¾ oz.; cinnamon, ¾ oz.; asafœtida, 6½ drm.; dissolve in 1 pt. brandy 20° above proof. Boil 2 lb. hog's liver for 12 hours in 1 gal. of water, add water continually so as to keep up the quantity of 1 gal.; mix the boiled liver thoroughly with the water, strain through a coarse sieve, and add this to the above mixture. It is self-evident that no chemical examination could ever detect the presence of half the above organic products.

Savonnettes (Soaps). See **Soaps.**

Saws.—*To Mend Broken Saws.*—File to a powder pure brass, 3 parts; pure silver, 28½ parts; pure copper, 1½ parts. Mix thoroughly. Put the saw on an anvil, the broken edges in contact. Put a line of the above mixture along the seam, cover with powdered charcoal. Take a spirit lamp and a blowpipe, hold the coal dust in place, and blow just enough to melt the solder. Set the joint smooth with a hammer. File away the superfluous solder.

To Remove Wire Edge.—After filing a saw, place it on a level board and pass a whetstone over the side of the teeth until all the wire edge is off them. This will make the saw cut true and smooth, and it will remain sharp longer. The saw must be set true with a saw set.

Saws, to Straighten.—You can straighten band saws in the following manner: Put the saw on to the machine and under tension, just as it is to be used. Use a steel straight edge 10 or 12 in. in length, to find the lumps or twists, which mark with chalk, so as to know where to hammer. Now hold the oval face of a millwright's or carpenter's hardwood mallet opposite the chalk marks and against the saw, and with a light, oval-faced hand hammer knock out the lumps. Commence carefully, do not strike too hard. Examine your saw often with your straight edge to see how you get along, and you will soon be able to take out twists readily and get your saw perfectly true.

To Saw Wood Easily.—Moisten the saw with kerosene.

Saxons. See **Pyrotechny.**

Scalds. See **Burns.**

Scalp, Tenderness of the.—This frequently arises from the practice of using very hot water on the head. It may be caused by the sudden change of temperature in shampooing from heat to cold. When the scalp is naturally tender, the head should be washed daily in cold water and friction used, care being taken not to abrade the surface. Afterward use rectified spirit, 1 oz.; water, 3 oz., as a wash. See also **Hair, the.**

Scars and Cicatrices, the Removal of.—The cicatrices, scars or marks left by various diseases, burns or wounds of divers kinds, are often less obstinately permanent than is generally supposed, and from some facts which have lately come under our notice, we are inclined to think that their prevention or removal in many cases may be accomplished by some mild but effectual antiseptic.

Among the exemplifications of the efficacy of the formula we are enabled to lay before our readers, is the case of a gentleman of our acquaintance, whose face was so severely burnt by the violent spurting of a quantity of melted lead (owing to a workman having incautiously dropped a wet pipe into it), that his eyes were only saved by pebble spectacles from utter destruction.

At first, of course, carron oil was the sole application, and as for weeks afterward particles of the granulated metal had literally to be dug out of the flesh, a deeply scarred countenance was naturally predicted by all, except the patient himself. One mark of an almost imperceptible character alone remained after the expiration of six months, owing, as our friend says, to the whole face being bathed twice or three times a day, as soon as the oil treatment could be discontinued, with a lotion

of the simplest character, as is readily seen by glancing at its constituents.

Lint soaked in the same solution and allowed to remain on some little time, will frequently mitigate the visible results of smallpox, and we have known one case of ringworm treated in this way to leave no scar whatever, while a sister of the latter patient, who had had the same disease in a lesser degree, but had not employed this lotion, still retains the evidences of the fact.

The following is a convenient formula: Borax, ½ oz.; salicylic acid, 12 grn.; glycerine, 3 drm.; rose water, 6 oz. Make a lotion.—*Magazine of Pharmacy.*

Scents. See **Perfumes.**

Scent Powders. See **Powders.**

Scouring Paste. See **Cleansing.**

Scouring Soap. See **Soaps.**

Scrap Books, Paste for. See **Pastes.**

Scratch Brush, Fluid for.—Use thin starch water to which has been added a trace of sulphuric acid.

Screen (Lantern), to Render Transparent.—Coat your screen with a varnish made of Venice turpentine dissolved in a good quality of spirits of turpentine. A sizing of the best white glue with a little glycerine added, renders a screen quite translucent.

Screw Cutting, Rule for Gearing up Engine Lathes for.—Read from the lathe index the number of threads per inch cut by equal gears and multiply it by any number that will give for a product a gear on the index; put this gear upon the stud, then multiply the number of threads per inch to be cut by the same number and put the resulting gear upon the screw.

Example.—To cut 11½ threads per inch. We find on the index that 48 into 48 cuts 6 threads per inch, then

$$6\times4=24, \text{ gear on stud,}$$
$$\text{and } 11\tfrac{1}{2}\times4=46, \text{ gear on screw.}$$

Any multiplier may be used so long as the products include gears that belong with the lathe. For instance, instead of 4 as a multiple we may use 6.

$$\text{Thus, } 9\times6=54, \text{ gear upon stud,}$$
$$\text{and } 11\tfrac{1}{2}\times6=69, \text{ gear upon screw.}$$

See also **Index of a Lathe.**

Screw, Rule for.—Disregarding friction, the rule is as follows:

Weight raised : { force applied } :: { circumference described by force } : { pitch of screw. }

Hence the relation will be the same for all screws having the same pitch.

The Standard Screw Threads.—Our United States, or Sellers, standard of screw threads and diameters has been now many years before the mechanics of the country, and yet it is far from being generally adopted and used. The difficulty of procuring its general adoption has, perhaps unjustly, been attributed to the selfishness of manufacturers, who prefer their own fractional threads in order that repairs and reduplications must come from them. There is a better reason, and possibly a juster cause; it is the dissatisfaction with the system itself. In fact, it is hard to establish a uniform, absolute system in screw threads. Every mechanic can readily see how different are the demands on a bolt on which the nut is set up to stay and on one that is to be used for adjustment. It makes a vast difference in setting up a nut on a bolt of two inches diameter with the standard pitch of four and a half to the inch and on another of the same diameter with a thread of six to the inch.

But, beyond special needs, the standard is objected to by many mechanics, because of the lack of proper relation (so they say) between the diameter and the pitch, particularly on diameters below one inch. The advance in diameters from one fourth of an inch to the full inch is by sixteenths of an inch, and the pitches, beginning with twenty to the inch and ending with eight to the inch, are ten in number. A three-eighths bolt is cut to a sixteen thread, which greatly weakens the bolt by its depth—much more so than an eight thread can weaken an inch bolt. Complaint is made that a half inch bolt with thirteen threads will twist in two before it will strip, and that a five-eighths bolt is ruined by cutting it eleven threads to the inch.

Our standard is very similar to the English, or Whitworth standard, having twenty-one pitches for twenty-nine diameters, while the Whitworth has eighteen pitches to the same number of diameters. Up to one inch the relations of pitches and diameters are the same, with the exception of the half inch bolt, which by United States standard has a thirteen thread, but by the Whitworth has twelve. In estimating the relative strength of bolt and pitch of thread, reference must be had to the form of thread. Beyond dispute the Whitworth is the strongest thread yet produced, as much above our modified sharp V-thread, called standard, as that is above the old V-thread itself, and more. Its rounding, or convex, bottom is never inducive to fracture. If it was not so costly to produce, it would take the place of our square bottom thread for all general purposes. Some of these objections against the standard will appear to have more than prejudice for their foundation, at least for some uses, by a comparison between the threads and diameters and a consideration of the hundreds of different purposes to which they are to be applied.

U. S. Standard.

Diam.	1/4	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	13/16
Pitch	20	18	16	14	13	12	11	11	10	10

Diam.	7/8	15/16	1	1 1/8	1 1/4	1 3/8	1 1/2	1 5/8	1 3/4
Pitch	9	9	8	7	7	6	6	5½	5

Diam.	1 7/8	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4
Pitch	5		4½	4½	4	4	3½	3½	3¼	3	3

Sea Sickness.—There is no remedy for this which will answer in all cases. Some people will always be sick. A dose of 30, 60 or 90 grn. of bromide of sodium three times a day is recommended. A recumbent position is best suited to the patient if ill. Every effort should be made to keep to the deck and a waterproof blanket will be found of use. Keep the bowels free and try to eat. Crackers, beef tea and olives are best relished.

Seidlitz Powder. See **Powders.**

Seidlitz Water. See **Waters.**

Seed Lac.—Seed lac is said to be more soluble in alcohol than shellac, and therefore to make a clearer varnish.

Seggars.—Boxes of a very refractory material used to contain valuable articles during the firing. The seggars for porcelain must stand an intense heat.

Sensitizing. See **Photography.**

Sepia. See **Pigments.**

Serpents, Pharaoh's. See **Pharaoh's Serpents.**

Sewer Gas, to Detect.—A suspected joint in a sewer or drain pipe may be tested by wrapping it with a single layer of white muslin, moistened with a solution of acetate of lead. As the gas escapes through the meshes of the cloth it will be blackened by the sulphur compounds.

2. It is usual to detect gas escapes by applying a lighted taper or candle to the suspected place of leakage. This is dangerous, and many explosions have thus been occasioned. A safer

mode is as follows: Mix dark soap and water in the proportion of 2 lb. of the former to 5 or 7 pt. of the latter. The sticky paste or liquid so obtained is ready to be applied by the brush to the gas pipe, when, if an escape is taking place, bubbles will readily be seen on the liquid; thus the positions of the gas escapes are indicated without any danger.

Shafting, Springing of.—If a shaft springs in running, the trouble lies probably in either a too small diameter of the shaft for its weight and velocity, a set of unbalanced pulleys, or an unequal strain on either side by the belts.

Shakdo. See **Alloys.**

Shampoo Liquors. See the **Hair.**

Shaving Cream. See **Creams.**

Shaving, Art of Easy.—The following is chiefly the substance of the instructions of the celebrated Mr. Mechi: 1. Never fail to well wash your beard with soap and cold water, and to rub it dry, immediately before you apply the lather, of which the more you use, and the thicker it is, the easier you will shave.

2. Never use warm water, which makes a tender face.

3. The moment you leave your bed (or bath) is the best time to shave.

4. Always wipe your razor clean, and strop it before putting it away; and always put your shaving brush away with the lather on it.

5. The razor (being only a very fine saw) should be moved in a sloping or sawing direction, and held nearly flat to your face, care being taken to draw the skin as tight as possible with the left hand, so as to present an even surface and throw out the beard.

6. The practice of pressing on the edge of a razor in stropping it soon rounds it; the pressure should be directed to the back, which should never be raised from the strop. If you shave from heel to point of the razor, strop it from point to heel; but if you begin with the point in shaving, then strop it from heel to point.

7. If you only once put away your razor without stropping it, or otherwise perfectly cleaning the edge, you must no longer expect to shave well and easy, the soap and damp so soon rust the fine teeth and edge.

8. A piece of soft plate leather should always be kept with razors, to wipe them with.

Shaving Cream.—

Curd soap	8 oz.
Almond oil	2 oz.
Glycerine	1 oz.
Spermaceti	½ oz.
Carbonate of potassium	¼ oz.
Water	16 oz.

Cut the curd soap into shreds, and dissolve it by the aid of a water bath in 14 oz. of water. Dissolve the spermaceti in the almond oil, and while warm mix it with glycerine, potash, and remainder of the water; transfer to a warm mortar, gradually and steadily incorporate the warm soap solution, and continue to stir until a smooth paste is formed. With this incorporate a suitable perfume.

Shaving Paste.—This popular cosmetic may be prepared in various ways, but the following formulæ may be taken as representing the mode of manufacture:

1. Take Naples soap, 1 lb.; Castile or Marseilles soap, ½ lb; honey, ½ lb.; essence of ambergris, oils of cassia and nutmeg, of each 20 to 30 drops. Mix these ingredients well together in a mortar, adding a little rose water, until a perfectly homogeneous paste is formed.

2. Take of white or virgin wax, spermaceti, and almond oil, of each 2 oz.; melt over a water bath, and then add 3 oz. of Windsor soap previously worked up into a paste with a little rose water. Mix all well together and place in a jar, which should be kept well covered.

3. White soft soap, 12 oz.; spermaceti and olive oil, of each 1½ oz. Melt these ingredients all together, and stir until the mass is nearly cold; perfume with any essential oil, or a mixture of perfumes, according to taste.

Shaving Soaps. See **Soaps.**

Shaving, to Prevent Soreness from.—The following is frequently used: Take of potassium cyanide, 6 grn. avoirdupois; glycerine, ½ oz.; strongest camphor water, 2½ oz.; mix. The foregoing is poisonous, and it must only be very cautiously used. The white powder or cake frequently used by barbers is magnesia, and can readily be procured from a druggist. Bay rum is also used.

Shawls, to Clean. See **Cleansing.**

Shellac, to Bleach. See **Bleaching.**

Shellac, Cement. See **Cements.**

Shellac, to Pulverize.—Inclose the shellac in strong cloth and beat with a hammer or iron pestle; sift the fine particles out and continue the operation until all is pulverized.

Shells, to Color.—A little lac dye is boiled and left standing to settle, it is then dissolved in a solution of tin chloride. The shells having been well cleaned, are dipped in this until they become the proper color.

Shells, to Silver. See **Silvering.**

Sherbet, for Dispensing.—Vanilla sirup, 1 qt.; pineapple sirup, 1 pt.; lemon sirup, 1 pt.

Sherry. See **Wines.**

Sherry Cobbler.—Take 1 tablespoon sugar; 2 or 3 slices of orange; 2 wineglasses sherry. Fill the tumbler with shaved ice and shake well.

Shingles, to Fireproof. See **Fireproofing.**

Shirtings, Dressing for White.—For 175 pt. of dressing take 11 lb. wheat starch, 2 lb. 3 oz. stearine, and 6 lb. 9 oz. china clay. Boil up together and apply hot, and dry on the cylinder.

Shirts, to Wash. See **Cleansing.**

Shoemaker's Ink. See **Inks.**

Shoemaker's Wax. See **Waxes.**

Shoes, Blacking for. See **Blacking.**

Shoes, Buckskin, etc., to Restore the Black, Velvety Appearance of.—First wet the surface well with strong alum water, and when nearly dry treat with a decoction of logwood boiled and filtered, to which is added a little acetate of iron. The skin will not be as soft as it originally was.

French Paste for Patent Leather.—Add to some pure wax which has been melted in a water bath some olive oil, and then some lard. Mix thoroughly by stirring over a moderate fire. Add some oil of turpentine, then a little oil of lavender. This will form a paste which should be put in boxes. Apply with a linen rag. The paste keeps the leather soft and restores the gloss.

Dressing for Tan Shoes.—

Beeswax	1 part
Oil of turpentine	4 parts.

Cheap Color for Shoe and Harness Edges.—One-half gallon of soft water; ½ oz. extract logwood; boil until the extract is dissolved. After removing from the fire add 1 oz. copperas, ¼ oz. gum arabic, ¼ oz. bichromate of potash, all to be pulverized.

White Finish for Shoes.—

Best white bonnet glue	1 lb.
Sulphate zinc, c. p	1½ lb.
Sulphate copper, ground	2 lb.
Pipe clay, bolted	1 lb.
Sulphate magnesia	1 lb.
Light yellow ocher	2 oz.
Water	4 gal.

Mix and let it stand until all is dissolved, then bring to boiling point and add 2 lb. oxalic acid and gum tragacanth, q. s. Iron or gum brush, in the usual way, and wax. If this is properly used, the red color will not work through.

Shoes, to Harden the Soles of.—1. If a pair of new shoes, have the soles made warm by holding them near a fire or stove, and then varnishing them with copal varnish, drying them, warming, and applying a second and third coat; the leather will become waterproof and very hard, lasting about twice as long as if not thus treated.

2. Stockholm tar rubbed on the soles of shoes hardens the leather materially, renders it impervious to water, and makes it wear much longer than leather not thus treated.

Shoes, to Remove the Smell of.—Try a strong solution of sulphate of iron, copperas, in water.

To Give a Fine Smooth Appearance to the Soles of Shoes after Scraping.—Stearine, 1½ parts, dissolved in 6 to 7 parts of benzine. Apply to the soles, and when dry, polish with a linen cloth.

Treeing Shoes, Composition for.—Dissolve gum tragacanth in water, then add a little ink to make it black, and finally a small quantity of neatsfoot oil It must be quite thin, or else, if thick, it is liable to cake. Take of—

Gum shellac	½ lb.
Alcohol	2 qt.

Dissolve and add—

Camphor	1½ oz.
Lampblack	2 oz.

Shoes, Varnish for. See **Varnishes.**

Shoes, to Waterproof. See **Waterproofing.**

Shot Metal. See **Alloys.**

Show Bottles, Colors for, Druggists.—*Amber.*—Dragon's blood, in coarse powder, 1 part; oil of vitriol, 4 parts. When thoroughly dissolved, dilute with cold distilled water till the required tint is obtained.

Blue.—1. Copper sulphate, 2 oz.; sulphuric acid, ½ oz.; water, 20 oz.

2. A solution of soluble Prussian blue in oxalic acid and diluted to the right shade.

3. Solution of indigo in sulphuric acid, diluted with water.

Crimson.—1. Iodine and iodide of potash, of each 30 grn.; hydrochloric acid, 1 drm.; water, 1 gal.

2. Alkanet root, 1 oz.; oil of turpentine, 20 oz.

Green.—1. Sulphate of copper, 1 drm.; bichromate of potash, 30 grn.; strong liquor of ammonia, 2 oz.; water, 1 gal.

2. Copper sulphate, 2 oz.; sodium chloride, 4 oz.; water, 1 pt.

3. Solution of verdigris (distilled) in acetic acid, diluted with water.

4. Dissolve blue vitriol in water, and add nitric acid until it turns green.

5. For dark green, chromium sulphate.

Magenta.—Acetate of rosaniline dissolved in water.

Olive.—Dissolve equal weights of iron sulphate and sulphuric acid in water and add copper nitrate, q. s. to strike the color.

Orange.—1. Dissolve bichromate of potash in water and add a little sulphuric acid.

2. Dissolve gamboge in liquor of potassa; dilute and add a little water.

Pink.—1. To a solution of cobalt nitrate or chloride, in water add sesquicarbonate of ammonia, q. s. to dissolve the precipitate at first formed.

2. From madder (washed with cold water), 1 oz.; sesquicarbonate of ammonia, 1 oz.; water, 3 pt.,. 12 fl. oz.; digest with agitation, for twenty-four hours; then dilute with more water and filter.

Purple.—1. Sulphate of copper, 2 drm.; water, 2 oz.; French gelatine, 1 drm.; boiling water, 2 oz.; solution of potassa, 2 pt. Dissolve the copper salt in the water, and the gelatine in the boiling water. Mix the two solutions and add the liquor of potassa. Shake the mixture a few times during ten hours, after which decant and dilute with water.

2. A solution of copper sulphate, 1 oz., in water, 1 qt., with the addition of 1½ oz. sesquicarbonate of ammonia.

3. To the last add a sufficient quantity of the first pink, above, to turn the color.

4. To an infusion of logwood, add carbonate of ammonia, q. s.

5. Lead acetate, 3 oz.; cochineal, 1 drm.; water, q. s.

6. Add sulphate of indigo, nearly neutralized with chalk, to an infusion of cochineal till it turns purple.

Red.—1. Solution of perchloride of iron, 10 drops; sulphocyanide of potassium, 10 grn.; water, 1 gal.

2. Dissolve carmine in ammonia and dilute with water.

3. Dissolve cochineal in a weak solution of ammonia; or in

4. Sal ammoniac, and dilute with water.

5. Add 4 oz. sulphuric acid to 1 gal. water, and digest 8 oz. red rose leaves in the solution for twenty-four hours.

6. Dissolve madder lake in sesquicarbonate of ammonia, and dilute with water.

Violet.—Mix together solutions of nitrate of cobalt and sesquicarbonate of ammonia, adding a sufficiency of ammonio-sulphate of copper to strike the required color.

Yellow.—1. A solution of sesquioxide of iron (ferric oxide), ½ lb., in 1 qt. hydrochloric acid, diluted with water.

2. To a strong decoction of French berries add a little alum.

3. A simple solution of potassium chromate or potassium bichromate.

4. A solution of equal parts of niter and potassium chromate.

5. A solution of potassium bichromate.

Shrinkage in Castings. See **Casting.**

Shrub.—A species of concentrated cold punch.—*Prep.* 1. Brandy Shrub.—*a.* Brandy, 1 gal.; orange and lemon juice, of each 1 pt.; peels of 2 oranges; do. of 1 lemon; digest for twenty-four hours, strain, and add white sugar 4 lb., dissolved in water, 5 pt.

b. Brandy at proof, 34 gal.; essential oils of oranges and lemons, of each 1 oz., dissolved in rectified spirit, 1 qt.; good lump sugar, 300 lb., dissolved in water, 20 gal.; mix well by rummaging, and gradually and cautiously add of a solution of tartaric acid in water or of Seville orange juice, q. s. to produce a pleasant but scarcely perceptible acidity; next rummage well for fifteen minutes, add water to make the whole measure exactly 100 gal., and again rummage well for half an hour; lastly, bung down loosely; in ten or twelve days it will usually be sufficiently brilliant to be racked. This is 66 u. p.

2. Rum Shrub.—As the last, but substituting rum for brandy.

3. Punch Shrub.—Concentrated punch, made with equal parts of spirit and water. Used to make punch.

4. Lemonade Shrub.—Concentrated lemonade. Used to make lemonade or lemon sherbet.

5. Shrub, West India.—Take 1 gal. of Jamaica spirits, 6 lb. of refined sugar, and 1 qt. of lime juice. Dissolve your sugar in the lime juice, and then mix it well with the spirits, after which put it into a demijohn to settle and become mellow. This will make excellent punch.

Siccative.—Those oils which thicken and dry into transparent flexible substance, forming a kind of skin, are said to be drying or siccative.

Sideraphite. See **Alloys.**

Sienna, Raw. See **Pigments.**

Silk, to Clean. See **Cleansing.**

Silk, Oil Bath for.—In order to render silk which has been dyed black more lustrous and shining, Mr. A. Gillet recommends the use of the following bath: Two parts soda crystals are dissolved in 100 parts water, the obtained solution being of 2° B. Olive oil is added to this bath until the oil begins to remain at the top of solution. Soap can be added. The addition of the citric, tartaric or acetic acid to this bath is not recommended, as any acid would only diminish the alkaline strength of the bath. If it is required to remove the white reflection the silk has acquired in the above bath, the silk can be washed in water containing citric, tartaric, or acetic acid.

Silk, to Dye. See **Dyeing.**

Silk, to Restore the Luster of, Lost in Dyeing.—Grate a dozen large potatoes into 1 gal. soft water, agitate briskly for a few minutes, and let stand for twenty-four hours to settle carefully; draw off clear liquid, sponge fabric thoroughly. Press very strongly in one direction, with hot irons, between fine clothes, kept moist.

Silver. See also **Niello.**

Silver. See **Alloys.**

Silver Amalgam. See **Amalgam.**

Silver, Burnishing.—Remove all dirt with powdered pumice stone, then brush all parts with strong soap suds; wipe with a linen cloth and burnish. Use soap water as a lubricant.

Silver, to Clean. See **Cleansing.**

Dead White on Silver Articles.—The article should be heated to a cherry red, or dull red, allowed to cool, then placed in a pickle of 2½ parts sulphuric acid to 50 parts water. Let it remain in the pickle one or two hours. If the surface is not right, rinse, and repeat the operation. When whitened enough, remove from the pickle, rinse well in hot water, and dry in warm boxwood sawdust.

Frosting and Whitening Silver, Pickle for.—Water, 6 oz.; sulphuric acid, 1½ drm. Heat and immerse the article in the pickle, until it is frosted. Wash well, dry with soft linen, or in fine boxwood sawdust. Less acid may be used for whitening only.

To Frost Polished Silver.—Make a solution of ½ oz. cyanide of potassium in ¼ pt. of water. Apply to the silver with a brush. Hold the silver with pliers made of lancewood or boxwood. Very poisonous.

Silver, German. See **Alloys.**

Silver, Nitrate. See **Photography** (*Silver Nitrate*).

Silver, to Oxidize. See **Oxidizing.**

Pink Tint upon Silver.—Fearn recommends the following for producing a fine pink tint on silver. Dip the cleaned article for a few seconds in a strong hot solution of chloride of copper, then rinse and dry it, or dip it in 90% alcohol, and ignite the spirit.

Silver, to Platinize.—Place some platinum in a small quantity of aqua regia or nitrohydrochloric acid, and keep it in a warm place for a few days, when it will have dissolved. As soon as it has dissolved, evaporate the liquid at a gentle heat until it is as thick as honey, so as to get rid of the excess of the nitric and hydrochloric acids. Add a little water, and it is ready for use. A dozen drops of this solution goes a long way in platinizing silver. The operation is performed in a small glass or beaker, covered with a watch glass to keep in the fumes, and placed in a little sand in a saucer to equalize the heat.

Silver, to Plate with. See **Electro-Metallurgy.**

Silver, to Polish. See **Polishing.**

Silver, to Recover.—Place in the open air or under a hood with a good draught; add a small quantity of salt, then dilute sulphuric acid until no further precipitate forms; allow to settle, wash the precipitate with clean hot water, mix it with a small quantity of water acidified with sulphuric acid, and a few fragments of pure zinc; collect and wash the reduced silver, separate the remaining fragments of zinc; dry and melt with a little borax glass.

To Separate Silver from Copper.—Mix equal parts sulphuric acid, nitric acid, and water. Boil the metal in this mixture until it is dissolved. Throw in a little salt to cause the silver to subside.

Silver Tree.—1. Nitrate silver, 2 drm.

2. Quicksilver, 1 drm. Dissolve No. 1 in ¼ pt. of filtered water, and set the glass vessel containing the solution on the chimney piece, where it is not likely to be disturbed. Now pour in No. 2; in a short time the silver will be precipitated in the most beautiful arborescent form, resembling real vegetation.

Silverware, to Preserve.—Silverware may be kept bright and clean by coating the articles (warmed) with a solution of collodion diluted with alcohol.

Silverware, to Polish. See **Polishing.**

Silver Wash.—Mix 1 part chloride of silver with 3 parts pearlash, 1½ parts common salt, and 1 part whiting, and rub the mixture on the surface of brass or copper, previously well cleaned, by means of soft leather or a cork moistened with water and dipped into the powder. When properly silvered, the metal should be well washed in hot water, slightly alkalized, and then wiped dry.

Silver, to Whiten.—Many different methods have been used. An old method is to dip the work in a thick solution of borax, then place it in a copper annealing pan, sprinkle it over with charcoal dust, and place the pan and its contents upon a clear fire. Heat until red hot, then withdraw and allow to cool. The work is next boiled in dilute sulphuric acid, and if the right color is not obtained, the process is repeated one or more times. The lower standards require five or six operations to effect the proper degree of whiteness.

Another plan is to dip the work in a mixture of 4 parts powdered charcoal and 1 part niter, well mixed with water. The work is heated until the coating is thoroughly dry, when it is removed from the fire, allowed to cool, and boiled out in a solution of bisulphate of potash. After two or three operations a beautiful dead white color is the result. It is then washed in soda and water containing a little soap, or scratched and burnished if required bright. The process is completed by drying in warm boxwood sawdust.

Gee's method of whitening consists of making the work red hot, and boiling in dilute sulphuric acid (1 part of acid to 40 parts of water). The process is repeated, if necessary, until the requisite color is obtained. This method is not suitable for very common work, which requires a thin deposit of pure silver by the electro method, or by chemical decomposition of certain silver salts applied in the form of a paste, instead of subjecting it to the above whitening process. The articles may also be dipped in solutions containing silver, when silver is deposited on their surface. This is termed a simple immersion process.

Silvering. See also **Electro-Metallurgy.**

Brass, to Silver.—Take 1 part chloride of silver (the white precipitate which falls when a solution of common salt is poured into a solution of nitrate of silver of lunar caustic), 3 parts of pearlash, 1 of whiting, and 1½ of common salt, or 1 part chloride or silver and 10 parts of cream of tartar, and rub the brass with a moistened piece of cork dipped in the powder.

Silvering Brass.—The first essential is that the metal be chemically clean, which is best done by the use of dilute nitric acid, followed by a wash with clean water, and then with dilute aqua ammonia, drying in sawdust. If the metal be then rubbed with chloride of silver dissolved in water, and then washed and again dried in sawdust, the result will be fine. It should, however, be immediately lacquered in order to preserve the surface.

Copper, Silvering Powder for Coating.—Nitrate of silver, 60 grn.; common salt, 40 grn.; cream tartar, 7 drm. This will be ready for application when mixed and moistened with a little water.

Silvering with a Dead Luster.—Mix 7 oz. white lead and 1 oz. white litharge, with linseed oil varnish. Mix this mass with an oil varnish.

Desilvering.—The following is a liquid which will dissolve silver without attacking copper, brass, or German silver, so as to remove the silver from silvered objects, plated ware, etc. It is a mixture of 1 part of nitric acid with 6 parts sulphuric, heated in a water bath to 160° F., at which temperature it operates best.

Silvering Glass.—1.—*a.* Reducing Solution.—In 12 oz. of water dissolve 12 grn. Rochelle salts, and boil. Add, while boiling, 16 grn. nitrate of silver, dissolved in 1 oz. of water, and continue the boiling for ten minutes more; then add water to make 12 oz.

b. Silvering Solution.—Dissolve 1 oz. nitrate of silver in 10 oz. water; then add liquid ammonia until the brown precipitate is nearly, but not quite, all dissolved; then add 1 oz. alcohol and sufficient water to make 12 oz.

To Silver.—Take equal parts of *a* and *b*, mix thoroughly, and lay the glass, face down, on the top of the mixture while wet, after it has been carefully cleaned with soda and well rinsed with clean water.

Distilled water shoul be used for making the solutions.

About 2 drm. of each will silver a plate 2 in. square. The dish in which the silvering is done should be only a little larger than the plate. The solution should stand and settle for two or three days before being used, and will keep good a long time.

2. Draper's Method.—Dissolve 560 grn. Rochelle salts in 3 oz. water. Dissolve 800 grn. nitrate of silver in 3 oz. water. Add silver solution to 1 oz. strong ammonia until brown oxide of silver remains undissolved. Then add, alternately, ammonia and silver solution carefully until the nitrate of silver is exhausted, when a little of the brown precipitate should remain; filter. Just before using mix with the Rochelle salt solution, and dilute to 22 oz. Clean the mirror with nitric acid or plain collodion and tissue paper. Coat a tin pan with beeswax and rosin, equal parts. Fasten a stick ⅛ in. thick across the bottom. Pour in the silvering solution. Put in quickly the glass mirror, face downward, one edge first. Carry the pan to the window and rock the glass slowly for ½ hour. Bright objects should now be scarcely visible through the film. Take out the mirror; set it on edge on blotting paper to dry. When thoroughly dry, lay it, face up, on a dusted table. Stuff a piece of softest thin buckskin loosely with cotton. Go gently over the whole silver surface with this rubber in circular strokes. Put some very fine rouge on a piece of buckskin, laid flat, on the table, and impregnate the rubber with it. The best stroke for polishing is a motion in small circles, at times, going gradually round on the mirror, at times across, on the various chords. At the end of an hour of continuous gentle rubbing, with occasional touches on the flat, rouged skin, the surface will be polished so as to be perfectly black in opaque positions, and, with moderate care, scratchless. It is best, before silvering, to warm the bottle of silver solution and the mirror in water heated to 100° Fah.

3. Siemens' Method.—For a long time aldehyde has been employed in the glass silvering process suggested by Liebig, but some difficulties of manipulation have led practical men to prefer other reducing agents. R. Siemens has modified the operation and greatly simplified the reducing of the silver. Dry ammonia gas is passed through aldehyde to produce aldehyde ammonia; 2·5 grm. of aldehyde ammonia and 4 grm. nitrate of silver to 1 liter of water is the proper porportion to take. The nitrate of silver and aldehyde ammonia are separately dissolved in distilled water, mixed and filtered. The object to be silvered must be thoroughly worked to free it from fat, and, if it be a globe or bottle, the liquid is poured in as high as it is desired to form the deposit. As soon as the heat which must be applied shows 50° C. the separation of the silver begins and soon spreads itself all over the whole surface. At first, when the coating is very thin, it looks dark, but soon assumes a metallic luster; when it is a brilliant white it is time to remove the fluid contents, as the mirror is apt to be injured by too long contact with the aldehyde. Flat objects are laid upon the mixture in the usual manner. In Germany, where aldehyde ammonia can be purchased at a reasonable cost, this process is highly prized. By making his own salt in the manner described above, the chemist in this country can also avail himself of the method. The simplicity of Siemens' process commends it to favor.

4. Petitjean's Method.—Up to 1840 mirrors were silvered exclusively by means of an amalgam, a process most destructive to the workmen employed. An important step was effected by an English chemist, Drayton, who conceived the idea of coating mirrors with a thin layer of silver, obtained by reducing an ammoniacal solution of nitrate of silver, by means of highly oxidizable essential oils. This process was subsequently modified by several chemists, but only became really practical when M. Petitjean substituted tartaric acid for the reducing agents formerly employed. The glass to be silvered is laid upon a horizontal cast iron table heated to 104° F. The surface is well cleaned, and solutions of silver and tartaric acid, suitably diluted, are poured upon it. The liquid, in consequence of a well-known effect of capillarity, does not flow over the edges, forming a layer a fraction of an inch in thickness. In twenty minutes the silver begins to be deposited on the glass, and in an hour and a quarter the process is complete. The liquid is poured off the glass, washed with distilled water, dried, and covered with a varnish to preserve the silver from friction.

The advantages are evident. Mercury, with its sanitary evils, is suppressed; there is a gain in point of cost, as 60 to 75 grains of silver, costing about 20 cents, suffice for 10·75 square feet, which, under the old system, would require 1½ pounds of tin and the same weight of mercury. A few hours suffice to finish a glass on the new system, while the old process required twelve days as the minimum. On the other hand, the glasses thus silvered have a more yellowish tint; portions of the pellicle of silver sometimes become detached, epecially if exposed to the direct action of the sun, and, despite the protecting varnish, the silver is sometimes blackened by sulphureted hydrogen. M. Lenoir has happily succeeded in overcoming these defects by a process alike simple and free from objections on sanitary grounds. The glass, silvered as above, is washed and then sprinkled with a dilute solution of the double cyanide of mercury and potassium. The silver displaces a part of the mercury and enters into solution, while the rest of the silver forms an amalgam whiter and much more adhesive to glass than pure silver. The transformation is instantaneous. The amount of mercury fixed does not exceed 5 to 6 per cent. The glass thus prepared is free from the

yellowish tint of pure silver. It is also less attacked by sulphur vapors and the rays of the sun, in which last request it is superior to mirrors silvered by the old process.—*Bulletin de la Societe d'Encouragement pour l'Industrie Nationale.*

5. First take 80 grn. of nitrate of silver (either lunar caustic or the crystallized salt), and dissolve it in 10 oz. of water, preferably distilled or rain water. To this add 2 oz. of alcohol and 2 oz. of aqua ammonia. The ammonia is added to the solution drop by drop, until the precipitate at first formed is dissolved. The solution is then allowed to settle for three or four hours, when it is ready for use, and forms solution No. 1. Then take 6 oz. of water and dissolve it in 24 grm. of nitrate of silver, and add to the same 30 grm. of arsenite or tartrate of copper, and then add, drop by drop, sufficient aqua ammonia to dissolve the precipitate of oxide of silver at first formed, and the arsenite or tartrate of copper, after which add 2 oz. of alcohol. Then make a separate solution of 48 grm. of potassa in 16 oz. of water. This last-mentioned solution is brought to a boiling temperature in an evaporating dish, after which the solution of nitrate of silver and arsenite or tartrate of copper is added, drop by drop, to the boiling solution of potassa, and the boiling is continued for about an hour, or until a white film collects on the surface, after which it is allowed to cool and filter, when it is ready for use, and forms solution No. 2.

In depositing the alloy upon the glass take a suitable quantity of filtered water, preferably rain or distilled water, and add to it equal parts of solutions Nos. 1 and 2, and mix the whole thoroughly, and apply this solution in any convenient manner to the glass to be coated, and the deposition immediately commences, and is allowed to continue, say for about ten minutes, until the metal in solution is entirely exhausted, when the glass will be covered with a coating of the alloy, having a brilliant reflecting surface adjoining the glass.

In order to increase the durability of the coating, it is preferable to deposit a second coating upon the first, which is done by repeating the operation before the first coating is dry, and after the coating is completed generally cover the whole with a heavy coat of asphaltum varnish, although this is not absolutely necessary, as the metallic alloy is sufficiently hard to stand ordinary wear without it.

By the above-described process an alloy having all the qualities of hardness and durability of the ordinary alloys of copper and silver is deposited upon the glass, and the degree of hardness may be varied or modified by varying the proportions of the different ingredients employed. Other salts of copper besides the arsenite or tartrate may be employed in conjunction with the nitrate of silver.—*By A. Laval, St. Louis, Mo.*

6. Martin's.

	Avoirdupois Wght.	
A.		
Nitrate of silver	175	grn.
Distilled water	10	oz.
B.		
Nitrate of ammonia	262	grn.
Distilled water	10	oz.
C.		
Pure caustic potash	1	oz.
Distilled water	10	oz.
D.		
Pure sugar candy	½	oz.
Distilled water	5	oz.

Dissolve and add—

Tartaric acid	50	grn.

Boil in a flask for ten minutes, and when cool add—

Alcohol	1	oz.

Distilled water, q. s., to make up to 10 oz.

For use take equal parts of A and B. Mix together also equal parts of C and D, and mix in another measure. Then mix both these mixtures together in the silvering vessel, and suspend the mirror face downward in the solution.

7. H. J. Burton's.

A.		
Nitrate of silver	25	grn.
Distilled water	1	oz.
B.		
Potash (pure)	25	grn.
Distilled water	1	oz.
C.		
Solution A	1	part.
Solution B	1	part.

Ammonia to just dissolve the precipitate.
Solution A to just cause a discoloration.

D.		
Loaf sugar	2,700	grn.
Distilled water	20	oz.
Nitric acid	2	drm.
Alcohol (strong)	10	oz.
Distilled water to make	80	oz.

For use—

Solution C	1	oz.
Solution D	1	drm.

Solution C is subject to slow decomposition; solution D, on the contrary, improves by keeping.

8. Solution 1.—Nitrate of silver, 1 oz.; water, 10 oz.

Solution 2.—Caustic potash, 1 oz.; water, 10 oz.

Solution 2.—Glucose, ½ oz.; water 10 oz.

The above quantities are those estimated for 250 square inches of surface. Add ammonia to solution No. 1 till the turbidity first produced is just cleared. Now add No. 2 solution and again ammonia to clear; then a little solution, drop by drop, till the appearance is decidedly turbid again. Then add No. 3 solution and apply to the clean glass surface. A film was obtained in forty-three minutes at a temperature of 56° F.

Mr. Common's plate of glass was rather a large one. It was 37 inches in diameter and 4½ inches thick, and weighed four hundredweight.—*By A. A. Common, F.R.A.S.*

Glass Balls, to Silver.—Lead and tin, of each 2 oz.; bismuth, 2 oz.; mercury, 4 oz. Melt together in order given. Have the globe perfectly clean and dry. Warm it, melt the amalgam and pour it in and roil it about until the glass is coated. Too high a heat in use will spoil them.

Amalgams for Silvering Glass Globes.—

Lead.	Tin.	Bismuth.	Mercury.
1	1	1	1
1	1	1	2

The lead and tin are melted first, after which the bismuth is added. The dross is scraped off and the mercury added, when the whole mixture is well stirred. Leaves of Dutch metal are sometimes added, according to the color which it is desired to impart to the globes.

To Silver Glass Globes.—The *Druggists' Circular* gives this formula for the purpose:

Nitrate of silver	1	oz.
Distilled water	3	oz.
Alcohol	3	oz.
Ammonia, sufficient, or about	1	oz.
Grape sugar	2	oz.

Dissolve the nitrate of silver in the water, add ammonia in a quantity just sufficient to redissolve the precipitate formed at first, add the alcohol, allow it to rest four or five hours and filter. The grape sugar is dissolved separately in 1 oz. of water, and added to the silver solution at the moment of using. The glass

globes being perfectly cleaned, the solution is poured into them, and the globes are turned on all sides in front of a moderate fire, so that the liquid touches every part alike. The coating is done in a few minutes, when the excess of liquid is to be removed and the globe washed with distilled water first, and lastly with alcohol. The success of the operation depends in a great degree on the cleanness of the surface of the glass to be silvered; the slightest speck of dust or grease spot is sure to show. A good way to claan the globes would be to wash them with a warm solution of soda, then with dilute nitric acid, and lastly with alcohol, care being taken not to touch with the fingers any part of the globes which is intended to be silvered.

Silvering Plate Glass.—A formulæ introduced by Dr. Henry Draper for silvering is the following: In 3 oz. water dissolve 1¼ oz. Rochelle salt, and, when dissolved, filter. A second solution containing 1¼ oz. nitrate of silver to 4 oz. water should be added cautiously to 1 oz. liquor ammoniæ, until a brown precipitate remains; then add fresh ammonia, and again, alternately, silver solution and ammonia, until the whole of the 4 oz. of silver solution has been used, and the mixture has still some of the brown oxide in suspension. This solution should be filtered, and when wanted for use, mix the two solutions together and add 12 oz. water. The plate glass, having been thoroughly cleaned, must be laid, face downward, on the solution, and in from twenty to thirty minutes the plate will be silvered. Of course, if you wish to silver a large plate, use more solution; or you may use the following: Distilled water, 6 oz.; nitrate of silver, 2½ drm., to which add ammonia carefully, until the precipitate is redissolved. Make a second solution containing ¾ oz. caustic potash to 16 oz. water. Add this to the first solution, when a brown precipitate will be formed, which must be redissolved by the addition of the requisite quantity of ammonia, added carefully. Now add 1½ pt. water; to this add nitrate of silver until an insoluble precipitate is formed. The solutions may then be kept ready for use. When about to use it, mix with it one tenth of its volume of a solution containing 1 oz. milk sugar to 10 oz. water. The great essential is to have the glass perfectly clean, otherwise the silvering will be patchy.—*W. J. Lancaster, in English Mechanic.* Improved. See silvering glass receipt, No. 2.

Cast Iron, to Silver.—1. To silver cast iron, 15 grn. nitrate of silver are dissolved in 250 grn. water, and 30 grn. cyanide of potassium are added; when the solution is complete, the liquid is poured into 700 grn. water wherein 15 grn. common salt have been previously dissolved. The cast iron intended to be silvered by this solution should, after having been well cleaned, be placed for a few minutes in a bath of nitric acid of 1·2 sp. gr. just before being placed in the silvering fluid.

2. A new process for silvering articles of iron is thus described. The article is first plunged in a pickle of hot dilute hydrochloric acid, whence it is removed to a solution of mercury nitrate, and connected with the zinc pole of a Bunsen element, gas carbon or platinum serving as the other pole. It is rapidly covered with a layer of quicksilver, when it is removed, washed, and transferred to a silver bath and silvered. By heating to 300° C. (572° Fah.) the mercury is driven off, and the silver firmly fixed on the iron. To save silver the wire can be first covered with a layer of tin. One part of cream of tartar is dissolved in eight parts of boiling water, and one or more tin anodes are joined with the carbon pole of a Bunsen element. The zinc pole communicates with a well cleaned piece of copper, and the battery is made to act till enough tin has deposited on the copper, when this is taken out and the ironware put in its place. The wire thus covered with tin chemically pure, and silvered, is said to be much cheaper than any other silvered metals.

Ivory, to Silver.—Take a small piece of nitrate of silver, and pound it in a mortar. Add some soft water to it, mix thoroughly and put in a bottle. Place the ivory article to be silvered in this solution, allow it to remain until it is of a deep yellow color. Put it then in clear water and place in the sun. If desired to draw any figure or name upon the ivory, it may be done with a camel's hair pencil, dipped in the solution. Wash well with water after the drawing has become a deep yellow, and put in the sunlight, occasionally wetting with clean water. Rub it after it has turned a deep black color, and it will change to a brilliant silver.

2. Make a weak solution of nitrate of silver, immerse the ivory in it, and allow it to remain, until the solution gives it a deep yellow color. Immerse in clear water, and expose it in the water to the sun. It becomes black in about three hours The black surface becomes brilliant silver by rubbing.

Silver Leaf, Varnished.—Use first, prepared ox gall; next, isinglass; then, alum, to kill the former; finish with hard white lac.

Metals, Silvering of.—Small articles may easily be coated with silver by dipping them first into a solution of common salt, and rubbing with a mixture of one part of precipitated chloride of silver, two parts of potassa alum, eight parts of common salt, and the same quantity of cream of tartar. The article is then washed and dried with a soft rag.

Plaster, to Silver.—Ordinary plaster models are covered with a thin coat of mica powder, which perfectly replaces the ordinary metallic substances. The mica plates are first cleaned and bleached by fire, boiled in hydrochloric acid, and washed and dried. The material is then finely powdered, sifted, and mingled with collodion, which serves as a vehicle for applying the compound with a paint brush. The objects thus prepared can be washed in water, and are not liable to be injured by sulphureted acids or dust. The collodion adheres perfectly to glass, porcelain, wood, metals, or papier mache.

Plating Pastes.—1. Nitrate of silver, 2 parts; salt, 2 parts; cream of tartar, 14 parts. Pulverize and mix.

2. For thin plating dissolve in 10 or 12 drops of water and add nitrate of silver, 2 parts; cyanide of potassium, 6 parts. Rub on the object.

3. One oz. of nitric acid is put in a glazed earthen vessel and placed over a slowly heating fire, and as it boils instantly the pieces of real silver are thrown in and dissolved immediately. When this is done a large handful of salt is put in, which will kill the acid. Then the paste is made by the means of common whiting. Clean the article to be plated and apply the paste with water and wash leather. Will keep for years.

Plating (Liquid Wash).—Dissolve 1 oz. crystals of silver nitrate in 12 oz. soft water, then dissolve in the water 2 oz. potassium cyanide. Shake the whole together and let it stand until it becomes clear. Have ready some half ounce vials and fill them half full of Paris white or fine whiting and then fill up the bottles with the liquid and it is ready for use. The silver coating is not as tenacious to the article as when electrolytically deposited. This is very poisonous and should be handled with great caution—if at all.

Ribbons, Silvering of.—Make a solution of nitrate of silver and add a little gum to it, so that the liquid will not run. Then with a camel's hair pencil or a new pen, draw any sort of ornamental figure on the silk. After the drawing is dry, hold the ribbon over a vessel containing water, zinc and a little sulphuric acid. In a short time the silver will be reduced and adhere quite strongly to the fabric.

Arabesques, wreaths, etc., executed in this

manner have a pretty appearance.—*Chronique Industrielle.*

Silvering by Cold Rubbing.—Make paste by thoroughly grinding in a porcelain mortar, out of the light—

Water	3 to 5 oz.
Chloride of silver	7 oz.
Potassium oxalate	10½ oz.
Salt (common table)	15 oz.
Sal ammoniac	3¾ oz.

Or—

Chloride of silver	3½ oz.
Cream of tartar	7 oz.
Salt (common)	10½ oz.

Water, to form a paste.

Keep in a covered vessel away from the light. Apply with a cork or brush to the clean metallic (copper) surface, and allow the paste to dry. When rinsed in cold water the silver presents a fine frosted appearance, the brightness of which may be increased by a few seconds' immersion in dilute sulphuric acid or solution of potassium cyanide. The silvering bears the action of the wire brush and of the burnishing tool very well, and may also be oxidized. Should a first silvering not be found sufficiently durable after scratch-brushing, a second or third coat may be applied. This silvering is not so adhering or white on pure copper as upon a gilt surface.

For the reflectors of lanterns the paste is rubbed upon the reflector with a fine linen pad; then, with another rag, a thin paste of Spanish white or similar substance is spread over the reflector and left to dry. Rubbing with a fine clean linen rag restores the luster and whiteness of the silvered surface.

The paste is sometimes mixed directly with the whiting and left to dry, or until nearly dry, then rubbed down as described.

Silvering Shells.—Grind silver leaf in gum water to the required thickness, and apply to the inside of the shell. For gold color grind gold leaf in gum water.

Silver Size, Preparation of.—Put in a pan 4½ oz. Spanish chalk, ½ oz. Venetian soap, ½ oz. beeswax, and 9 oz. finely pulverized fat pipe-clay; roast thoroughly. Rub fine with the whites of 40 eggs. Form the mass into small balls, dry upon a glass plate. To apply the size, triturate a piece with water, then put in a glass and dilute with water. Brush the frame with the dissolved size and let it dry before applying another coat.

Writing on Silver. See **Inks.**

Yellow on Silver.—Immerse the silver articles in a hot solution of concentrated cupric chloride.

Similor. See **Alloys.** (*Mannheim Gold.*)

Sirups. See **Syrups.**

Size.—Obtained from glue, from the skins of animals, but is evaporated less and kept in a soft state.

Bronzing Asphaltum.—Drying oil and turpentine make an excellent size for this purpose.

Anti-Mildew Size.—(Whitehead.)—The materials employed for sizing yarn, woven fabrics, etc., may be rendered proof against mildew by the addition of a little mustard oil, or other vegetable oil, possessing antiseptic properties. About 4 oz. of oil to 1 gal. of size is usually sufficient.

Black Gold Size.—Triturate, 1 oz. gold size with enough lampblack to form a dense color. Thin with turpentine.

Sizing and Dressing Cotton, Wool, Straw, etc.—Glycerine for Sizing and Dressing.—1. For white goods: Glycerine, 5 parts; starch, 3½ parts.

2. Glycerine, 3 parts; sulphate calcium, 7½ parts; kaolin, 13½ parts.

Cotton, Size for.—Beef bones, boiled in water for some hours with rock salt and a little alum, yield a size which can be used in the preparation of cotton and silk goods.

Oil Size.—Grind yellow ocher or burnt ocher with boiled linseed oil, and thinned with turpentine.

Currier's Size.—Sizing, 1½ qt.; soft soap, 1½ gill; stuffing, 1½ gills; sweet milk, ¾ pt.; boil the sizing in water to a proper consistency, strain and add the other materials. Mix thoroughly.

Gold Size.—1. (Oil size). Drying or boiled oil thickened with yellow ocher or calcined red ocher, and carefully reduced to the utmost smoothness by grinding. It is thinned with oil of turpentine. Improves by age. Used for oil gilding.

2. (Water size). Parchment or isinglass size mixed with finely ground yellow ocher. Used in burnished or distemper gilding.

3. Place boiled oil in a stone pot and place on a gentle fire, and allow the heat to rise almost to the point of ignition, then set fire to it, and let it burn until it is thick, then put on the cover to extinguish the flames. Now strain through silk and thin with turpentine.

4. The following is highly recommended: Heat slowly 8 oz. best drying oil and just before it comes to a boil add 2 oz. gum animi, boil until of the consistence of tar, then strain through silk. A little finely ground vermilion may be added if desired; thin with turpentine. Dilute with oil of turpentine.

5. Gold size is prepared from ½ lb. linseed oil with 2 oz. gum animi; the latter is reduced to powder and gradually added to the oil while being heated in a flask, stirring it after every addition until the whole is dissolved; the mixture is boiled until a small quantity, when taken out, is somewhat thicker than tar, and the whole is strained through a coarse cloth. When used, it must be ground with as much vermilion as will render it opaque, and at the same time be diluted with oil of turpentine, so as to make it work freely with the pencil.

Ivory Size or Jelly.—Boil ivory dust or ivory shavings in water. This forms a beautiful size or jelly.

Japanners' Gold Size.—Quarter lb. lead acetate, 4 lb. gum animi, 1¾ gal. turpentine, 1 gal. drying oil. Boil the gum in the oil for four hours, add the other materials and strain.

Painters' Size.—Boil raw oil in a pan till a black smoke emits therefrom; then set it on a fire, and, after burning for a few minutes, cover the pan to put out the blaze; pour the oil while warm into a bottle in which some pulverized red lead and litharge have been introduced. Stand the bottle in a warm place for two weeks, shaking often. It will then be ready to decant and bottle.

Parchment Size.—This consists of gutta percha softened and extended in ether. It furnishes a preservative coating for pictures, cards, etc. Any extraneous matter is easily removed by means of a damp cloth. Easily effaceable charcoal or chalk drawings are fixed if this solution be distributed over their surface in fine spray. The ether evaporates and leaves the gutta percha, which forms an extremely thin but protective coating over the design.—*Science Record*, 1874.

Sizing for Sign Work.—One of the best mordants or sizing for sign work is made by exposing boiled linseed oil to a strong heat in a pan; when it begins to smoke, set fire to the oil, allow it to burn a moment, and then suddenly extinguish it by covering the pan. When cold it will be ready for use, but will require thinning with a little turpentine.

Skin, The. See also **Cosmetics,** and the numerous cross references given under **Cosmetics.**

Beautifying the Skin.—In the work on diseases of the skin, edited by Professor Von Ziemssen, Dr. Heinreich Auspitz, of Vienna, makes the following observations upon this subject:

1. A healthy integument is not necessarily beautiful. Even if all requirements concerning diet, residence, atmospheric and climatic conditions, etc., are carried out, the complex-

ion is often extremely bad. The general condition of health has no influence upon the beauty of the complexion, though it has upon the health of the skin.

2. Cleanliness is a *sine qua non* of the beauty of the complexion, though it does not play a great part in the health of the skin.

3. Water is serviceable to the skin in only moderate amounts and at moderate temperatures. Very cold or warm baths, when used to excess, diminish the elasticity of the skin and its power of resistance to external irritants.

4. Distilled and so-called soft waters are more suitable for washing, and less irritating than hard water.

5. The hard soda soaps are usually preferable to the soft potash soaps for toilet purposes. The quality of soaps depends upon the quality of their constituents and the thoroughness of their saponification. Good soaps must not contain free alkali or any foreign irritating substance. The addition of moderate quantities of perfumes does not materially change the quality.

6. Simple, finely ground powders, such as starch, magnesia, etc., are entirely innocuous, and often act as a useful protection against external irritants.

7. Frequent application of alcohol abstracts the water of the skin, makes it dry and brittle, and impairs its nutrition. This is also true of glycerine. All toilet washes containing alcohol to any considerable extent should be avoided.

8. This is true to a still greater extent of other additions to washes, such as corrosive sublimate, mineral acids, certain metallic salts, etc.

9. Camphor acts merely as a bleaching powder. This is also true of benzoic resin, sulphur flowers, and substances containing tannic acid.

10. The use of sweet-smelling oils and fats should be employed to a greater extent than is now done for toilet purposes.

11. This is particularly true with regard to the growth of the hair. The nutrition of the scalp should be increased by the rational application of fat (for example in the form of oil baths, by means of the application at night of a sponge soaked in oil upon the scalp) and the greater use of simple pomades. These should be applied to the roots of the hair, rather than the shafts.

12. Substances should be avoided, or sparingly used, which abstract water from the skin and the roots of the hair.

Face, Blotched.—Rose water, 3 oz.; sulphate of zinc, 1 drm. Mix; wet the face with it; gently dry it, and then touch it over with cold cream, which also dry *gently* off.

Hands, to Clean.—Put ¼ lb. Glauber's salt, ¼ lb. chloride of lime, and 8 oz. water into a little wide-mouthed bottle, and when required for use pour some of the thick sediment into a saucer and rub it well over the hands with a nail brush.

Hands, Glycerine Jellies for the.—The *Pharm. Era* gives the following formulas:

1. Tragacanth	60	grn.
Glycerine	2	oz.
Water	4	oz.
Extract of rose	6	drops.
2. Gelatine	2	drm.
Glucose	1	oz.
Glycerine	6	oz.
Water	3	oz.
Oil of rose	5	drops.

Hands, to Keep Soft.—

Use before retiring.—

Glycerine	1 oz.
Bay rum	3 oz.
Oil cajeput	½ drm.
Oil bergamot	½ drm.

Mix well.

Take 4 parts glycerine, 5 parts yelk of egg; mix thoroughly and rub on after washing the hands. A little lemon juice will also assist to whiten the hands.

Hands, to Whiten the.—Take a wineglassful of eau de cologne and another of lemon juice; then scrape two cakes brown Windsor soap to a powder and mix well in a mould. When hard, it will be excellent for whitening the hands.

Irritable Skin.—Irritable skin must be protected as much as possible from the changes of temperature. In warm weather, lotions of salt and water, or of alum and water should be used. If the parts are tingling or feel congested, a lotion of hydrocyanic acid, 1 drm.; water, 1 oz.; may be used occasionally. What is wanted most of all to remedy in a physiological manner this condition is a very powerful astringent, which will not stain or injure the skin. Unfortunately no such drug is at present known.

Perhaps the best substitute for this desideratum, beside those mentioned, are—

1. Sulphate of iron	1	drm.
Water	1	oz.

Or, make a mixture of crushed ice and salt, both powdered very fine; place this in a muslin bag, suspended in a cool place over a vessel. When a sufficient quantity of liquid has dropped into the latter, add powdered alum—1 part to 4 of liquid. This is a cold astringent. It should be kept in a stone bottle, and in a cool place.

2. Crushed ice	4	parts.
Common salt	4	parts.
Powdered alum	2	parts.

Sulphate of iron may be substituted for the alum; or—

3. Common salt	1	part.
Nitrate of potash	1	part.
Hydrochlorate of ammonia	1	part.
Water—sufficient to dissolve the powders.		

This too, is a very cold application, and may be kept in the same manner as the preceding.

An easy method of cooling and softening the heated skin is to bathe it in milk in which ice has been dissolved, or the milk may be iced in a refrigerator; either of these, too, may have alum dissolved in them, as directed above.

The following is a simple astringent preparation:

4. Tannin	1	drm.
Infusion of catechu	1	oz.
Decoction of oak bark	1	oz.

It should, however, not be used to pale skins, as it leaves a temporary stain, but it will be found of service when the skin is of such a dark color that this becomes of no consequence.

Skin, Marks on the.—Discoloration.—Residents in hot climates who are of a dark complexion often find, after having been in England for a few years, that the face skin becomes mottled in appearance, patches of light alternating with patches of dark color. Treatment: Apply nightly to the dark patches

Emulsion of bitter almonds	1	pt.
Oxymuriate of mercury	2½	grns.
Sal ammoniac	1	drm.

Or touch them with crystals of saltpeter moistened with water.

Nævus, commonly called mother's marks or port wine mark, is caused by the dilatation and increased growth of the small blood vessels of the skin. This may be arterial, venous or capillary. In size nævi vary from a pin's head to nearly the whole extent of the face. No patient should himself operate on a nævus greater in circumference than a small pea. The simplest method of removal is by means of concentrated nitric or hydrochloric acid. A match or similar piece of wood should have one end bitten out into a form of brush; this should be dipped into the acid, and one large

drop placed on the nævus, the skin around which should be thickly covered with lard. The acid should be brought into contact with the whole extent of the nævus. Then, over the scab formed, may be laid the following paste:

Carbonate of bismuth	1	part.
Glycerine	1	part.
Extract of belladonna	1	part.
Hydrocyanic acid	1	part.

The use of the acid causes a good deal of pain, but it is a very effectual method of removal.

A certain amount of inflammation is sure to follow any operation on a nævus, but when the latter is of small extent this is seldom of a violent character and the formula given will prove a sufficient remedy. After three days the paste may be gently washed off with warm water, and the following preparation gently but effectually rubbed into the scab, over which a thickish layer should be afterward placed and the whole covered by court plaster. Common cream, 1 part; white wax, 2 parts; glycerine, 1 part; spermaceti, 1 part. The scab should now be allowed to fall off without further interference. Another method of removing nævi is to keep them constantly moistened with a very dilute acid solution. One oz. dilute nitric acid to 4 oz. water. If an operation be objected to, and the patient wishes to hide the deformity, the following will be found a harmless effectual paint. If properly made it should dry like enamel and not crack: Wood charcoal, 1 part; carmine, 1 part; chalk, 10 parts; glycerine, 3 parts; flexible collodion, 8 parts; rectified spirits, 2 parts. The color of this may be varied by the relative amounts of carbon, chalk and carmine used. Another and a simpler method is to powder the nævus, say of a white color, and then apply a layer of flexible collodion. The nævus should be moistened before the powder is applied.

Skin, Pallid.—This is generally only a local indication of a general condition, and that condition is debility. There may be no apparent physical weakness, but, nevertheless, the system lacks that tone which is essential to the proper performance of those bodily functions the integrity of which constitutes health. Anæmia is often present. The causes may, at their commencement, be: 1, dissipation, study, or any excessive demand on the nervous centers; 2, loss of blood or other vital fluids; 3, insufficient supply of food or oxygen. In any case the nervous centers become affected. As local measures for the treatment of pallid skin, cold bathing may be recommended, followed by friction with a soft towel. The following may be used for the cheeks: Dilute liquid ammonia, 1 oz.; glycerine, 2 oz.; water, 4 oz. This should be applied once daily for about three minutes, being well worked into the skin, afterward a soft towel should be used for three or four minutes. If any irritation follows, the glycerine may be doubled in quantity.

Thin Skin.—Sometimes the epidermis is so thin that blisters arise from the slightest irritation. Treatment: Bathe the skin with—

Rectified alcohol	2	parts.
Glycerine	1	part.
Water	2	parts.

This is to thicken and harden the epidermis.

Redness of Skin.—Red spots, with ray-like blood vessels seemingly issuing from their centers, are a species of nævus, and may be treated in the same way. Sometimes great numbers appear on the cheeks; they are then very small, and frequently connected over the whole surface of the skin by red lines, which mark the course of dilated blood vessels. This condition is most frequently seen in patients suffering from heart or lung disease, and is due to impeded circulation and consequent congestion of the blood vessels. Let the face be washed twice daily in warm water, and afterwards well rubbed. Dry friction with a soft towel should be freely practiced. The following will be of service if applied once daily: Chloride of lime, 1 oz.; warm water, 12 oz. Redness may be due to plethora of full bloodedness. The whole skin of the face is then of a reddish tint, and subject to flushing; the eyes are moist. The patient frequently subject to fits of profuse perspiration and attacks of nose bleeding.

Treatment: This must be constitutional. Locally, the following cooling washes may be used as often as desired:

1. Carbonate of soda	1	part.
Prepared chalk	1	part.
Borax	1	part.
Glycerine	3	parts.
Oatmeal water	6	parts.

Drunkards and gluttons very frequently suffer from enlargement or hypertrophy of the nose. The latter condition is commonly known as cauliflower or carbuncle nose. In addition, most of those who are much addicted to the pleasures of the table exhibit a physiognomy characterized by a full, plethoric, purplish color of skin; these individuals are commonly said to be bloated.

Treatment: Rich living must be forsworn, and a plain, nutritious dietary substituted. Constitutional treatment will also be necessary. With regard to cauliflower nose, the best treatment is the surgeon's knife; but if this is objected to, the patient must rely on internal remedies, with the following local application:

2. Iodide of potassium	30	grn.
Bromide of potassium	30	grn.
Extract of belladonna	80	grn.
Lard	1¼	oz.

This may be applied nightly, being well rubbed into the skin of the enlarged parts. Frequent bathing in cold water and subsequent dry friction will assist in promoting absorption.

The unsightly appearance of the skin may be improved by using.

3. White wax	1	part.
Borax	1	part.
Prepared chalk	2	parts.
Juice of bitter almonds	1	part.
Oatmeal water	2	parts.
4. Glycerine	8	parts.
Starch	1	part.
Chalk	4	parts.
Carbonate of soda	2	parts.
Oatmeal water	3	parts.

These may be freely used.

Skins. *Skins, to Dye.* See **Dyeing.**

Sheepskin Mats, to Prepare. See **Mats.**

Skins, to Prepare for Fur.—Mix bran and soft water sufficient to cover the skins. Immerse the latter and keep them covered for twenty-four hours; then remove, wash clean, and carefully scrape off all flesh. To 1 gal. of water (hot) add 1 lb. of alum and ¼ lb. of salt. When dissolved and cool enough to admit entrance of the hand, immerse the skins for twenty-four hours, dry in the shade, and rub. Stir the liquor again, immerse the skins for twenty-four hours, dry, and rub as before; immerse for twenty-four hours in oatmeal and warm water, partially dry in the shade, and finally rub until entirely dry. This leaves the skin like white leather, and fit for immediate use.

Skins, to Preserve (as a Mole Skin).—Supposing the skins are dry, they should be softened throughout by soaking in pure water; soft water is best, but any ordinarily pure water may be used, and care must be taken that the skins are thus soaked only a sufficient time to soften them. Then clean off any bits of flesh that may remain on the flesh side, rinse all well, shake off the loose water, and gently stretch out and tack on a board, flesh side up. Then sprinkle with a mixture of powdered alum and salt, about ⅔ alum and ⅓ salt, enough to just cover every part. As the skin dries it

takes up the mixture, but if any be left on the surface the second day, sprinkle on a little more water, otherwise put on more alum and salt, and sprinkle. Two to three days should be sufficient for such small skins, the idea being to give the skin all of the alum and salt it will take up, while in a moist condition. This tawing process makes the hair firm, a gentle rubbing and beating softens the flesh side, and it is preserved from decay, although tawed skins are never calculated so stand much wetting. This process is well adapted for all small skins, although those which are heavier require more time, and the flesh sides are sometimes folded together, and the skins rolled up. When the skins are freshly taken off, no soaking is needed, but more care is then called for in thoroughly washing off and cleaning them, and the first application of salt and alum should be in the proportions of one half each. It requires the judgment of a tanner to deal with skins in a dry state which may have become partly damaged before drying, and it requires special knowledge also to tell whether a dry skin is so damaged.

Skins, to Remove the Odor of.—Scrape off as much of the flesh and fat as possible with a blunt knife, and immerse then for forty-eight hours or more in the following solution: Salt, 4 lb.; alum, 1 lb.; water, just sufficient to dissolve. On removing wash in a weak solution of soda and water.

Skins, to Tan. See **Tanning.**

Slate, Artificial Writing.—Fine sand, 41 parts; lampblack, 4 parts; boiled linseed or cotton seed oil, 5 parts. Boil thoroughly together. Reduce the mixture by adding spirits of turpentine, so that it may be easily applied to a thin piece of pasteboard. Give three coats, drying between each coat; finish by rubbing smooth, with a piece of cotton waste, soaked in spirits of turpentine. Makes excellent memorandum books, etc. Use a slate pencil.

Slate Work.—In the best work, slates are secured by copper nails. Iron nails dipped in boiled oil to prevent their corroding may be used. The nails should have large heads, thin and flat, so that they may not prevent the slates from lying close. Every slate should be secured with two nails; and in fastening, care should be taken not to bend or strain the slates, or they will crack and fly under sudden changes of temperature.

Slate Roofs.—A square of slate or slating is 100 superficial ft. The lap of slates varies from 2 to 4 in. The pitch of a slate roof should not be less than 1 in. in hight to 4 in. in length.

Slating for Blackboards. See **Paints.**

Slip.—A mixture of clay and water.

Smallpox Pitting.—This may be prevented by covering the pystules with flexible collodion. To remove the pitting where it has occurred follow these directions: Wash the face every day for some minutes in hot water, then rub the face with a soft towel until it is aglow. Every morning use the following wash:

Dilute spirit of ammonia, 1 part; glycerine, 2 parts; water, 3 parts. Once daily rub the following into the skin: Subnitrate of bismuth, 6 parts; powdered silica, 5 parts; calcium fluoride, $\frac{1}{100}$ of a part; prepared lard, 7 parts; spermaceti, 5 parts; olive oil, 2 parts. This should be freely rubbed over the whole surface of skin affected. Before retiring to rest, the ridges between the pits may be painted with a strong solution of iodide of potassium.

Smelling Salts. See **Salts, Smelling.**

Snuff Scents.—Of the substances used, singly and combined, to scent snuff, the following may be mentioned as the principal:

1. Tonquin beans and their oil or essence.
2. Ambergris, musk, civet, and their essences.
3. Leaves of orchis fusca.
4. Root and oil of calamus aromaticus.
5. Powder and essence of orris root.
6. Cedar wood, rhodium wood, sandal wood.
7. Essences, essential oils, or ottos of bergamot, cassia, cedra, cinnamon, cloves, lavender, lemon, orange flowers (neroli), rhodium, rose geranium, roses (otto), etc.

In practice, a sufficient quantity of the powder, essence, or oil, having been well mixed with a little of the snuff, the perfumed mixture is added to the whole quantity of snuff to be scented, and the mass is well stirred up and turned over. It is, lastly, passed or rubbed through a sieve to insure the perfect diffusion of the scent through the whole mass.

8. Oil of lemon, separately qualified with a little oil of cassia, cloves, nutmegs, etc.

9. Oil of bergamot	2	oz.
Neroli	1½	drm.
Otto of roses	½	drm.
Oil of rhodium	½	drm.
10. Oil of bergamot	2	oz.
Oil of lemon	1	oz.
Oil of lavender (English)	½	oz.
Oil of verbena	1	drm.
11. To the last add—		
Oil of cloves	¾	oz.
12. Essence of tonquin bean	2	oz.
Essence of vanilla	½	oz.
Essence royale	1	drm.
Oil of cinnamon	1	drm.
Otto of roses (or oil of rhodium)		a few drops.
13. Essence of ambergris	1½	oz.
Essence of musk	1½	oz.
Liquor of ammonia (0·880-2)	1	fl. drm

Many other like combinations are kept. A few drops will scent several ounces of snuff. Diluted with ten to twenty times their bulk of rectified spirit, they form delightful scents (bouquets) for the handkerchief, etc.

Soaps and Soap Making.—*On the Manufacture of Soap in Small Quantities without Boiling.*—Mr. W. J. Menzies, in the course of a paper on the above subject, printed in the *Chemist and Druggist* of August 4, gives the following practical recipe:

Take exactly 10 lb. of double refined 98% caustic soda powder (Greenbank), put it in any can or jar with 45 lb. (4½ gal.) of water, stir it once or twice, when it will dissolve immediately and become quite hot; let it stand until the lye thus made is cold. Weigh out and place in any convenient vessel for mixing, exactly 75 lb. of clean grease, tallow, or oil (not mineral oil). If grease or tallow be used, melt it slowly over the fire until it is liquid and just warm—say, temperature not over 100° F. If oil be used, no heating is required. Pour the lye slowly into the melted grease or oil in a small stream continuously, at the same time stirring with a flat wooden stirrer about three inches broad; continue gently stirring until the lye and grease are thoroughly combined and in appearance like honey. Do not stir too long, or the mixture will separate itself again. The time required varies somewhat with the weather and the kind of tallow, grease, or oil used; from fifteen to twenty minutes will be enough. When the mixing is completed, pour off the liquid soap into any old square box for a mould sufficiently large to hold it, previously dampening the sides with water so as to prevent the soap sticking. Wrap up the box well with old blankets, or, better still, put it in a warm place until the next day, when the box will contain a block of 130 lb. of soap, which can afterward be cut up with a wire. Remember the chief points in the above directions, which must be exactly followed. The lye must be allowed to cool. If melted tallow or grease be used, it must not be more than warm. The ex-

act weights of double refined 98% powdered caustic soda and tallow or oil must be taken; also the lye must be stirred into the grease, not grease or oil added to the lye. If the grease or tallow used be not clean or contains salt it must be rendered, or purified, previous to use, that is to say, boiled with water, and allowed to become hard again to throw out the impurities. Any salt present will spoil the whole operation entirely, but discolored or rancid grease or tallow is just as good as fresh for soap making purposes.

If the soap turn out streaky and uneven it has not been thoroughly mixed. If very sharp to the taste too much soda has been taken. If soft, mild and greasy, too little soda has been used. In either case it must now be thrown into a pan and brought to a boil with a little more water. In the first case boiling is all that is necessary; in the other instances a very little oil or a very little more of the double refined powdered caustic soda must be added to the water. These things will never happen, however, if the directions are exactly followed, and after the soap has been made several times with the experience thus gained the process is extremely easy and the result will be always a good batch of soap. Beef tallow makes the hardest soap, mutton fat a rather softer soap; of oils, cotton seed is the cheapest and best, but the soap is much softer, lathering very freely indeed. Ordinary household fat or dripping will make a nice soap and in many places can be obtained at a very trifling cost, and in exchange for goods sold. Such grease, however, must be carefully examined for salt, which it often contains. It will be evident that any smaller quantity of soap can be made at a time, according to the above directions, by taking the ingredients in exact proportion. It is not advisable to make more than double the quantity prescribed, as it is difficult to work more by hand. By making successive batches, however, a single person can make two tons of soap in a day simply with apparatus (pans, etc.) obtainable in any household.

By adding a few drops of essential oil just when the mixing is completed a toilet soap is produced. Oil of mirbane (artificial almond oil) is the cheapest, but the perfume is not nearly so pleasant as real almond oil, citronella or oil of cloves. If made with clean grease or tallow or light colored oil, the soap produced is quite white.

Sometimes a little coloring matter will make the soap sell better, although of no better quality. Half an ounce of bichromate of potash ash dissolved in the lye will give a green; 1 lb. palm oil melted with the tallow or oil, a yellow color; or a good brown can be got by burning ½ lb. of sugar in a saucepan until black, then dissolving it in a pint of water, and adding it to the melted tallow before mixing.

A very cheap and good jelly soft soap can be made with the above soap. Take 5 lb. of the hard soap, crush it down or cut it up into as small pieces as possible; put this into a pan or boiler with 10 gal. of water if a strong hard tallow soap; if an oil soap only half the quantity of water (five gallons); just bring it to a boil, and stir well, to thoroughly dissolve all the pieces of hard soap; pour or ladle it into any can, tub or barrel that is tight, and leave it to cool for two or three days. This will give about 80 lb. of jelly soft soap, at an exceedingly small cost. Of course, if made from colored and scented hard soap it will be a colored and scented jelly soap. This is a good way of working up the scraps and bits of soap after cutting up. It can be sold with a good profit at a very low figure and often as a substitute for regular soft soap. It is a very different article, however, to a real potash soft soap, which should invariably be used for washing woolens. It is possible to produce this real potash soft soap in the cold by a somewhat similar process to the above.

Boiling Soap.—The Paste.—This operation is to produce a preliminary combination of fat and ley. Some soap makers use during the whole operation a ley of the same strength, while others commence with a weak ley, then use one of middle strength, and finish with a strong one. In the first case, a ley is employed of 10° to 15° B. In the second, of 7° to 10°, 15° to 18°, and 18° to 25° B., successively. In some cases, as for red oil soap, very strong leys are employed, say of 25° to 30° B.; usually the fat is first put in the pan and then the ley is added. For the paste operation no leys should be used containing foreign salts, such as are found in inferior kinds of soda, for it is then very difficult to form a union of the fats with the ley, and no good sud is obtained. But when the soap has been separated from the ley by salt, leys containing salt may be used. In saponifying red oil, salty leys may also be employed from the beginning. It is imperative in all operations that the ley should be caustic, because carbonate of soda will not unite with fat. For transforming 100 lb. of fat into soap, about 14 lb. of caustic soda are necessary, but generally more is employed, because the soda used is never a pure hydrate of soda. The quantity of ley taken is also differently regulated by the manufacturers. Some add the whole amount of ley at the commencement, others add it gradually in small quantities. This last mode is preferable. From time to time, in order to test it, a drop of the paste should be put on the tip of the tongue, when, if there is still free alkali in it, a burning sensation will be produced, in which case the boiling must be continued until the soap gives a sweetish taste. More ley should then be added, under constant stirring, until the entire quantity is consumed. At this stage the contents of the kettle are transformed into a homogeneous, clear liquid, in which neither ley nor fat can be discovered. If the liquid is perfectly clear, it shows that the right proportion of fat and ley has been applied. Should saponification progress too slowly, a weak ley of from 1° to 2° B. may be added, and soap scraps will facilitate the combination of the fat with the alkali. By heating with an open fire, it sometimes happens that a portion of the paste, when it thickens, sticks to the bottom of the vessel and burns. This is indicated by a black smoke passing off here and there with the vapor. When this occurs, the fire should forthwith be reduced, and some gallons of the strongest ley added to prevent further mischief. By this means a slight separation of the soap from the ley is occasioned, and the contact between the former and the metallic surface destroyed. In all cases the paste operation is complete, when, on taking out the stirring rod, the paste no longer drops from it, but slides down in long threads.

Cutting Up the Pan.—This is done by stirring into the ingredients of the soap kettle either soda ley containing salt, or a solution of salt, or dry salt. The separation is founded upon the insolubility of the soap in brine or strong caustic leys, whereas weak leys would dissolve it. Of all soaps the cocoa nut oil is the most remarkable, for, being dissolved by a brine solution, it is peculiarly serviceable for washing in salt water, whence its name, marine soap. This soap becomes so hard, that when separated from the glycerine, it cannot be cut with a knife, and consequently the salting operation should not be performed, but the soap boiled in strong ley with one water. The following is the method by which the salting operation is effected: One workman gradually adds the brine or dry salt, while another agitates the paste with a stirring rod from below upward. This is done under gentle boiling. It is essential to add the salt in the right proportion; the whole amount requisite should not be stirred in at once, but in portions of about one sixth.

After half of it has been dropped in, the soap should be allowed to boil for about ten minutes before any addition is made. According to concentration, 12 to 16 lb. of salt are necessary for 100 lb. of fat, to separate the formed soap from the surplus of water, The separation is perfect when the aqueous portion is observed to run off from the curdy mass; when a sample is taken with a spatula, it is not of an adhesive character while hot; and when, on placing some in the palm of the hand, and rubbing it with the thumb, it hardens into firm scales. The termination of the process is also indicated when the surface splits up into several fields, seperated from each other by deep furrows, in which there is not the fresh and soft appearance of froth, but of dry slabs. The fire should be extinguished when the soap, hitherto covered with froth and bubbles, suddenly sinks, and the froth breaks up into roundish massive grains, distinctly separated from each other and from the saline solution. The salting being completed, let the mass remain quiet for several hours, and then the under ley may be drawn off by the faucet.

Clear Boiling.—This operation is to obtain hardness, consistency, and complete neutrality of the soap. Commence to boil the paste gently with tolerably strong leys. Some manufacturers proportion the quantity of ley to be used, and having put in the first, boil for eight hours or so, then draw off the ley, put in the second, boil again, draw off, and so on. Should the soap, during the intervals, become too liquid, which may happen if a too weak ley has been applied, some handfuls of salt must be added, or the soap boiled with a weak ley containing salt. After each addition of ley, there should be, in taking up a portion by the spatula, some difficulty in running off the ley. Should this not be the case, water must be added, whereupon a quicker union of the alkali with the fat will be obtained. The process is terminated when large, regular, and dry scales appear on the surface, and when these give elastic, brilliant, white scales, and are easily pulverized by rubbing them in the palms of the hands. The soap should then be covered, left for some time, and eventually removed in the ladles.

Of the principal varieties are:

Almond Soap.—A toilet soap made of almond oil and soda.

Castile Soap, Spanish Soap, Marseilles Soap.—Soap chiefly imported, made of olive oil and soda. It occurs both in the white and mottled state; the former being said to be the purest; the latter the strongest. It is the hard soap (sapo, sapo durus) of the pharmacopœias. It is chiefly used in medicine and the toilet.

Curd Soap.—Made of tallow or suet (chiefly) and soda.

Mottled Soap (commercial).—Made of refuse kitchen fat (chiefly) and soda.

Naples Soap.—Made of olive oil and potash.

Olive Oil Soap.—Castile soap (vide supra).

Palm Soap, Palm Oil Soap, Violet Soap (commercial).—Made of palm oil and soda. It has an agreeable odor of violets.

Soft Soap.—1. (Commercial). A dark, strong, fetid soap, made of whale, seal, or cod oil, tallow, and potash.

2. Soft Olive Oil Soap, Medicinal or Toilet Soft Soap.—Soap made of olive oil and potash. It is yellowish white, inodorous, and of the consistence of thick honey. It is the soft soap (*sapo mollis*) of the pharmacopœias.

3. White Soft Soap.—Soap made of lard and potash. Only used in cosmetics and as a toilet soap.

Toilet Soaps.—Any of the preceding milder soaps, taken singly or mixed, and variously scented and colored.

Yellow Soap, Rosin Soap.—Made of tallow, rosin, and soda. Palm oil, when cheap, often replaces the tallow, or a portion of it.

Agricultural Soap (whale oil soap).—Soda lye 30° B., 1½ part: whale oil foot, 3 parts. Make by the cold process. Used for destroying insects on plants.

White Alabaster Soap.—Stearin, 6½ lb.; cocoa nut oil, 11 lb.; glycerine, 6½ lb.; lye of 38° B., 9 lb.; alcohol of 96%, 13 lb. The stearin and cocoa nut oil should be saponified by heating with the lye to 178° F., then the alcohol should be added. When these combine, add the glycerine. After the soap becomes clear, let it cool to 133° F., when it may be put in the frames. Perfume with 2 oz. oil of bergamot, ½ oz. oil of geranium, 7 drm. oil of neroli, ½ oz. oil of lemon.

Almond Soap.—Oil of almonds by weight, 21 oz.; solution of caustic soda (sp. gr. 1·334) by weight, 10 oz. Add the lye to the oil in small portions, stirring frequently. Leave the mixture for some days at a temperature of from 64° to 68° F., stirring occasionally, and when it has acquired the consistence of soft paste, put it into moulds till sufficiently solidified. It should be exposed to the air for one or two months before using.

Bitter Almond Soap.—1. Pure white soap, 10 kilos.; oil of bitter almonds, 120 grm. Not colored.

2. Or, white tallow soap, 56 lb.; oil of almonds, ¼ lb. For inferior kinds, nitro benzol is employed instead of oil of almonds.

3. Best white tallow soap, ½ cwt.; essence of bitter almonds, 10 oz.; as soap a la rose. Very fine.

4. White curd soap.....100 lb.
   Oil of bitter almonds.....20 oz.

Ambergris.—1. Curd soap, 7 lb.; oil of caraway, ¼ oz.; essence of bergamot, ½ oz.; essence of ambergris, ¼ oz.

2. Grease perfumed with ambergris and musk, 25 lb.; jasmine pomade, 10 lb.; rose pomade, 10 lb.; gum tragacanth, 3 oz.; caustic soda ley, 33° B., 25 lb. Color light brown with caramel. The musk and ambergris have to be added to the grease some weeks before making, frequently melting and stirring.

Ammoniated Soap.—The subjoined formula is given by the *Journal of the Society of Chemical Industry*. A soap is first formed in the usual way from the following ingredients: Stearic acid 8 parts, cocoanut oil 4 parts, potash and soda, of each 1 part; water, 6 parts. The soap when cold is cut into shavings, which are then placed in a retort, in which they are subjected to the action of gaseous ammonia at a pressure of 15 lb. per square inch, until the soap has become thoroughly impregnated with it.

Antimonial Soap.—Pure white Castile soap in powder, 1½ oz.; golden sulphide of antimony, 2 dr.; solution of caustic potassa, 6 dr. Dissolve the sulphide in the potash and add to the soap; then triturate in a mortar until a stiff paste is formed. It should have a grayish white color.

Antiseptic Soap (for preserving birds, anatomical preparations, animals, etc.)—1. Curd soap, 4 lb.; carbonate of potash, ½ lb.; arsenic, 1 lb.; camphor, ½ lb. Dissolve the soap with a very little water, and add the other ingredients powdered and mixed together.

2. Laurent's.—Put in a bottle 1 oz. powdered soap; 4 drm. arsenite of potassa; 4 drm. sulphate of alumina; 4 drm. pulverized camphor; add 12 oz. alcohol. Let the mixture stand twenty-four hours; then add 6 drops oil of thyme and cork the bottle carefully.

Arsenical Soap.—Becœur's.—1. Arsenic, 5 oz.; camphor, 6¼ drm.; white soap, 5 oz.; carbonate of potash, 15 oz.; air slaked lime, 5 oz.; made into a stiff paste with a little water. Used in preparing the skins of birds and other small animals.

2. Arsenical soap is used by bird and animal stuffers to preserve the skins from the attacks of insects. It is prepared by the following formula: White soap, arsenious acid, and lime slaked by air, of each 4 oz.; carbonate of soda, 12 oz.; powdered camphor, ¾ oz. The whole of these ingredients are worked up into a paste,

with pestle and mortar, a small quantity of water being added during the mixing.

3. Arsenical Soap, Cosmetic.—Arsenicated soap.—

Arsenite of soda	½ drm.
Soft water (hot)	1½ oz.

Dissolve, add the solution to—

White Windsor soap (melted)	1 lb.

Mix thoroughly, and form the mass into small cakes. The whole process should be performed in glass, porcelain or stoneware. Used by some ladies in fashionable life, under the idea that it promotes the softness, clearness, and general beauty of the skin. Sometimes the solution is beaten up with the soap (in shavings), instead of being added to it in the melted state, with or without the addition of 1 to 2 drm. of powdered camphor.

Arsenical soap is not recommended for toilet purposes.

Beef Marrow Soap.—To 500 lb. beef marrow add 250 lb. caustic soda lye of 36° B., stir constantly and gently, and heat the mass till it becomes soluble in water. In this state dilute with 2,000 parts boiling water, and pour in 1,000 parts brine (containing 180 parts common salt), with constant stirring. After allowing some time for repose, pour into the frames, and leave for a day or two to set thoroughly.

Benzoin Soap.—

White curd soap	40 lb.
Tincture of benzoin	54 oz.

The soap must be in the form of a very stiff paste, otherwise the tincture of benzoin will render it rather soft. Brown ocher may be used as the coloring agent.

Bergamot Soap.—Cocoa nut oil, 4 lb.; lard, 1 lb.; soda lye of 40°, 2½ lb.; perfume with bergamot oil, 1 oz.; oil of geranium, ¾ drm.

Soap Berry.—The fruit of a West Indian plant, *sapindus saponaria*. It is said to have a much greater cleansing power than the best soap.

Bismarck Soap.—Cocoa nut oil, 1½ lb.; castor oil, 2 lb.; soda lye of 40° B., 7 lb. Perfume with cinnamon oil, 1¼ oz.; oil of cloves, 2½ drm.; oil of sassafras, 4 drm.; oil of bergamot, 2½ drm.; oil of lemon, ¾ oz. Color with Bismarck brown to a dark color.

Black Soap, or Farrier's Soap, is a coarse kind of soft soap, made from fish oils and caustic potash; sometimes tar is added. Besides the substances above named, iodine, bromide, creosote, and many other chemical substances have been employed for making what are sometimes termed skin soaps, but they are all prepared much in the same way as above indicated.

This is properly a crude soft soap made of fresh oil, tallow, and potash; but the following mixture is usually sold for it: Soft soap, 7 lb.; train oil, 1 lb.; water 1 gal.; boil to a proper consistence, adding ivory black or powdered charcoal to color.

Boracic Soap.—The marked cleansing powers of borax have been long recognized, as well as its utility in restoring health and vigor to the diseased epidermis. The soap has already been considerably employed as a toilet remedy for itching, freckles and eruption, as well as for securing a clear and healthy complexion. At the same time it forms a splendid shampooing soap, cleansing the hair from excess of fat, from dandruff, etc., in a thorough and expeditious manner.

Borax Soap.—1. Mr. Rowbottom produces borax dry soap, or soap powder, by adding borax to the usual carbonated or silicated ash or alkali, or other substance used in the manufacture of dry or powder soaps For borax soft soaps he adds a solution of borax to the ingredients usually employed for making ordinary soft soaps before or during the manufacture, or he dissolves by heat any ordinary soft soap in the borax solution, and incorporates the same, after which the mass is allowed to cool in the usual manner.

2. Borax (in fine powder)	1 oz.
Honey or Windsor soap (recent)	1 lb.

Mix by either beating them together in a mortar or by a gentle heat. Used to whiten and soften the skin, prevent chaps, etc. It is an excellent soap for raw or tender parts requiring washing, and will lather with hard water. Like other soaps of the kind, it should not be left or dipped in the water.

Borax Soap Powder.—

Curd soap in powder	5 parts.
Soda ash	3 parts.
Silicate of soda	2 parts.
Borax, crude	1 part.

Each ingredient is thoroughly dried and all mixed together by sifting.

Borax Soft Soap.—

White fats	100 lb.
Soda ley, 15° B	100 lb.
Potash ley, 10° B	60 lb.
Solution of borax, 10° B	15 lb.

The soda ley is added to the melted grease and heated till it forms a clear liquid or is combined, when the potash ley and borax solution are added. It should be a semi-solid translucent paste, and is usually sold in quart cans.

Bouquet.—Savon au Bouquet.—1. This soap is prepared from the following: White curd soap, 60 lb.; olive oil soap, 40 lb.; perfume with oil of bergamot, 13 oz.; oil neroli, 1½ oz.; oil of cloves, sassafras and thyme, each, 1¼ oz. Color with brown ocher, 22 lb.

2. Best tallow soap, 30 lb.; ess. of bergamot, 4 oz.; oils of cloves, sassafras and thyme, of each 1 oz.; pure neroli, ½ oz.; finely powdered brown ocher, 7 oz. *Mix as last.* Very fine.

3. White tallow or lard soap 10 kilos. Perfume with oil of bergamot, 15 grm.; neroli, 15 grm.; sassafras, 10 grm.; thyme, 10 grm. Color with 100 grm. brown ocher. The oil of neroli may be replaced by oil of lavender, and oil of cloves, 10 grm., may also be added.

4. White curd soap (finest)	7½ lb.
Olive oil soap	2½ lb.
Oil of bergamot	1 oz.
Oil of cassia	1½ drm.
Oil of cloves	1½ drm.
Oil of sassafras	1½ drm.
Oil of thyme	1½ drm.
Neroli (or essence de petit grain)	1 drm.
Ocher (brown, levigated)	2 oz.

And proceed as for almond soap (ante). Highly and agreeably fragrant. It may be varied by substituting English oil of lavender for the neroli. Some makers color it with burnt sugar instead of ocher.

Bran Soap.—Add to good soap from 2 to 4% of bran.

Bubbles, Soap.—This receipt is given by Prof. Josiah P. Cooke: 1. Procure a quart bottle of clear glass and some of the best white Castile soap (or, still better, pure palm oil soap). Cut the soap (about 4 oz.) into thin shavings, and, having put them into the bottle, fill it up with distilled or rain water, and shake it well together. Repeat the shaking until you get a saturated solution of soap. If on standing, the solution settles perfectly clear, you are prepared for the next step; if not, pour off the liquid and add more water to the same shavings and shake as before. The second trial will hardly fail to give you a clear solution. Then add to two volumes of soap solution one volume of pure concentrated glycerin.—*The New Chemistry*, p. 29. Grand soap bubbles can be blown with this preparation.

2. Take olive oil soap (genuine white Castile), cut it into thin shavings, and dry thoroughly. Dissolve these shavings in alcohol until the alcohol is saturated. The solution should show a specific gravity of 0·88.

Mix glycerine with water until it shows a

density of 17·1° Baumé. To 6·102 cubic inches of solution 3, add 1·52 cubic inches of solution 2, and boil until the alcohol is all expelled—until the temperature rises above 212°. Cool and turn into a graduated flask, and add water to make the volume 6·102 cubic inches. Filter, if necessary, to remove oleate of lime.

3. Cut up Castile soap into fine shavings, place one part in a clean bottle with 40 parts of rain water, and let it stand for a day with repeated shakings. Let it settle a few hours and pour off the clear solution; if necessary, filter through flannel.

4. Dissolve some finely cut Castile soap in water, and add a little glycerine. If distilled water is used, take 50 grm. of the soap to ¼ liter of water; when settled add one-half the amount of glycerine.

Camphor Soap.—1. Tallow curd soap, 50 lb.; oil of rosemary, 2½ lb.; camphor, 2½ lb. Powder the camphor by triturating it with some almond oil, and sift. When the soap is ready to put in the frame add the camphor and rosemary oil.

2. Spermaceti .. .. 4 oz.

Melt it by a gentle heat, add of—

Camphor (cut small)..... 2 oz.

And when dissolved, add the mixture to—

White curd soap..... .. 6½ lb.

Carbolic Acid Soap.—1. Half palm soap, 20 lb.; starch, 1 lb.; carbolic acid in crystals, 1 oz.; oil of lavender, 2 oz.; oil of cloves, 1 oz. The carbolic acid is added to the soap in a melted state and thoroughly incorporated.

1. This is also made into soap containing a variable amount of the agent up to 25 per cent. The latter, specially suitable for surgeons' use, can be prepared by mixing in a warm mortar 75 parts of powdered stearin soap with 25 parts of pure carbolic acid and pressing the product in toilet soap forms; it lathers well and only slowly dissolves. A soap containing even so much carbolic acid can be used without any injurious results for the hands, though, of course, it is not advisedly adapted for general use.

Castile, White.—1. Olive oil, 40 parts; ground suet, 30 parts; tallow, 30 parts.

2. Olive oil, 30 parts; lard, 30 parts; palm nut oil, 40 parts.

3. Oilve oil, 30 parts; cotton seed oil, 30 parts; tallow oil, 40 parts.

4. Palm oil (bleached), 50 parts; sesame oil, 20 parts; tallow, 30 parts.

Castor Oil Soap.—This soap, prepared as below, is said, by Mr. Hammer, to answer best for preparing soap liniment (linimentum saponis co.).—

Saponify 2 pt. of castor oil with 6 oz. of caustic potash and 2 pt. of water, by heating until a transparent mixture is obtained; then add a saturated solution of 8 oz. of chloride of sodium, stir until cool, allow to subside for a day, decant the liquid portion, cut in pieces, and dry for use.

Chemical. — Powdered fuller's earth, ½ oz.; just moisten with spirits of turpentine; add salts of tartar, ½ oz.; best potash, ½ oz.; work the whole into a paste with a little soap. It is excellent for removing grease spots.

Chinese Soap.—Saponify 60 lb. cocoanut oil with 30 lb. of lye of 38° to 40° B. Perfume with oil of Portugal, 1¾ oz.; oil of bergamot, 2¼ oz.; oil of lemon, 1½ oz.; tincture of musk, 6 oz.; oil of patchouli, 3¾ drm.

Chlorinated Soap.—Powdered Castile soap, 11 oz., and dry chloride of lime, 1 oz., are beaten into a mass with sufficient rectified spirit, holding in solution oil of verbena or ginger grass, ¼ oz. The mass is then formed into flat tablets, and wrapped in thin sheet gutta percha.

Cinnamon Soap.—

White curd soap.....60 lb.
Palm oil soap..... .....40 lb.

Color with 2 lb. of yellow ocher and perfume with—

Oil of cinnamon.....14 oz.
Oil of sassafras .... 2½ oz.
Oil of bergamot..... .. 2½ oz.

2. Pure palm soap, 5 kilos.; tallow soap, 5 kilos. Perfume with oil of Chinese cinnamon, 80 grm.; sassafras, 20 grm.; bergamot, 30 grm. Color with 80 grm. yellow ocher and 20 grm. burnt sienna. For inferior descriptions, oil of cassia is used instead of oil of cinnamon.

3. Best tallow soap, 30 lb.; best palm oil soap, 20 lb.; essence of cinnamon, 7 oz.; essence of sassafras and bergamot, of each 1¼ oz.; finely powdered yellow ocher, 1 lb. Mix as soap à la rose. Very fine.

4. White curd soap (finest)..... 6 lb.
Palm oil soap (finest).... ..... 3½ lb.
Olive oil soap ..... 1 lb.
Oil of cinnamon..... 1½ oz.
Oil of bergamot..... ¼ oz.
Oil of sassafras ..... ¼ oz.
Oil of lavender (English)..... 1 drn
Yellow ocher (levigated) ..... ¼ lb.

Citron Soap.—Curd soap, 6 lb; otto citron zestes, ¾ lb.; otto of verbena (lemon grass), ½ oz.; otto of bergamot, 4 oz.; otto of lemon, 2 oz.

Cocoanut Oil Soap.—Put 50 lb. cocoanut oil and 50 lb. caustic soda lye of 27° Baumé into a soap kettle; boil and mix thoroughly for 1 or 2 hours, until the paste gradually thickens; then diminish the heat, but continue stirring till the cooling paste assumes a white, half solid mass; then transfer quickly to the frames. A mixture of equal parts of cocoa nut oil and tallow will make a very fine filled soap. Cocoanut oil mixed with almost any fats, if they are not in too large proportions, will produce filled soaps.

Cod Liver Oil Soap.—2 oz. cod liver oil; caustic soda, 2 drm.; water, 5 drm.; dissolve the soda in the water and mix it with the oil.

Cold Cream Soap.—Spermaceti soap, 25 lb.; white soap, 37½ lb.; caustic potash, 6°, 1¼ lb.; gum tragacanth, 2½ oz.; oil of almonds, 5½ lb. Shred the soap, put in the hopper of the mill, dissolve the gum in a little water, and mix with the lye and oil. Add this to the soap, and grind. Perfume with oil of bitter almonds, 1¼ oz.; oil of cloves, 1¼ oz.; oil of bergamot, 6¼ oz.

Savon de Crimee.—White curd soap, 16 lb.; palm soap, 4 lb.; color with vermillion, 2½ drm.; brown ocher, 1 oz.; ivory black, ½ oz. Perfume with oil of thyme, mint, rosemary, each 1 oz.; oil of lavender, 2½ drm.; oil of cloves, 1¼ drm.; tincture of benzoin, 1½ oz.

Cream Soap.—Take white, soft, lard potash soap, recent, but moderately firm, and beat in small portions at a time, in a marble mortar, until it forms a white homogeneous mass; add sufficient essential oil of almonds, supported with a little oil of bergamot, or of cassia, put in during the pounding.

Croton Soap.—From croton oil and liquor of potassa equal parts; triturated together in a warm mortar until they combine.

Dawson's Patent Composite.—Strong potash lye, 75 lb.; tallow, 75 lb.; cocoa nut oil, 25 lb. Boil until the compound is saponified in the usual manner.

To make thirty pounds of the new composition, take 2 gal. boiling soft water in a kettle, add ½ lb. sal soda, 2 oz. borax, 2 tablespoonfuls spirits turpentine, and 1 teaspoonful linseed oil. Stir this mixture until the borax and soda are dissolved; then add 15 lb. of the above soap, made from lye, tallow and cocoa nut oil; and continue the boiling with stirring for fifteen minutes, until the whole is incorporated and dissolved. Now add 2 oz. spirits of hartshorn and stir. It may be scented with any essential oil or odor, and colored, if desired; then run off and moulded into cakes fit for toilet use. It is a good soap for chapped hands, and free from any disagreeable odor.

Disinfecting Soap (Jeye's Improved).—Gas tar is distilled and the light oil rejected; 16 parts

of the heavier oil, 32 parts of cocoa nut oil, and 16 parts of caustic soda at 35° B. are saponified in a jacketed pan, with or without the addition of rosin, and sodium sulphate and carbonate.

Dogs, a Soap for Washing, and other animals is sometimes made by mixing Stockholm tar (wood tar) with melted soap. The tar should first be dissolved in pyroxylic spirit (wood naphtha).

Egg Yelk Soap.—Cocoa nut oil, 8 lb.; tallow, 8 lb.; yelks of 50 eggs added to olive oil, q. s. to make 4 lb.; soda lye, 38° B., 8½ lb. Perfume with oil of lemon, 2 oz.; oil of cloves, ½ oz.; oil of sassafras, 1¼ oz. Color pale yellow. Good for the complexion.

Eichbaum's Soap.—In order to make a soap from strongly smelling fish fats, F. Eichbaum takes 400 kilos. of the fat, 25 kilos. raw palm oil, 250 kilos. lye of 12° B., and warms up. A further similar amount of lye of 15° B. is added, and the thoroughly mixed mass allowed to boil till clear and free from scum, more lye being added when necessary. The mass is then poured in a thin stream through 20° lye, 50 kilos. powdered rosin are added gradually, and then 40 kilos. lye of 20°, and the mass boiled. When ready, the soap is salted in the ordinary way. The addition of the rosin is said to lessen the fishy smell considerably.

Elder Flower Soap.—

Half palm soap	100	lb.
Dextrine	3	lb.
Perfume with—		
Oil of bergamot	8	oz.
Oil of lavender	2	oz.
Oil of thyme	2	oz.
Oil of cloves	1	oz.
Oil of cassia	½	oz.
Oil of almonds	½	oz.

Color light green.

Erasive Soap.—To remove stains and grease from clothing.—Two lb. good Castile soap, ½ lb. carbonate of potash, dissolved in ½ pt. hot water. Cut the soap in thin slices, boil the soap with the potash until it is thick enough to mould into cakes; add alcohol, ½ oz.; camphor, ½ oz.; hartshorn, ½ oz.; color with ½ oz. pulverized charcoal.—*Science Record*, 1875.

Flowers of Erin.—White curd soap, scented with oil of roses, 1 drm.; spirits of violet, ½ fl. oz.; spirits of jasmine, ½ fl. oz.; spirits of patchouli, ¼ fl. oz.; spirits of vanilla, ¼ fl. oz. Tinged green or rose.

Fabrics, Soap for Removing Stains from.—

	1	2
Fatty acids	50·0	40·0
Potash	11·5	9·5
Water	38·5	50·5

The soap should contain a slight excess of alkali, but no resin (which hardens the fabrics), starch or silicate should be present,

3. This is prepared from a good white soap, cut into thin shavings. For 6 lb. of the soap take one ox gall, and the whites of four eggs, and mix all the ingredients in a mortar, adding 2 lb. powdered alum. When the whole has been well incorporated, the mass is to be kept in a damp place for twenty-four hours. It is said that this soap finds much favor with scourers for removing grease, etc.

Essence of Soap.—Under this title various preparations are made; but they are all solutions of soap in warm alcohol, with, generally, the addition of a small quantity of potash. Soaps made from vegetable oils are preferred, because they remain clear and liquid when cold, whereas those prepared from animal fats become solid in cooling. Dussauce gives the following formula for preparing this soap:

White Marseilles soap	6½	oz.
Alcohol at 85°	1	qt.
Potash	6	drm.

Cut the soap into fine shavings, and put them into a bottle holding about ½ gal. (a Winchester bottle would suit admirably); add the alcohol and potash, and heat gently, without boiling, over a water bath; stir with a glass rod. When the solution is complete, take it out of the water bath, and add the essences. A very sweet perfume may be given to this preparation by adding to it—

Oil of geranium	1½ drm.
Oil of verbena	2½ drm.

To color yellow, add 2½ drm. saffron.

This essence continues limpid at the ordinary temperature. To use it, pour a little into ½ tumbler of water and stir quickly.

Essence de Savon Vienne.—

White soap	3	oz.
Carbonate of potash	1	drm.
Alcohol at 95°	18	oz.
Lavender water	6	oz.

Digest and filter.

Essence de Savon Corinthe.—Dry white soap, 10 oz.; alcohol at 80°, 1 qt.; potash, 2 oz.; essential oil, a few drops. Digest. Any perfumed toilet soap may be converted into an essence; but doubtless the white Castile soap would form the most elegant preparation, besides being the most emollient.

Essence de Savon de Corinthe.—

Alcohol 30° B.	1 qt.
Dry white soap	9 oz. 6 drm.
Potassa	1 oz. 7 drm.
Essential oil, for perfume	some drops.

Rasp the soap, put it in a vessel with the alcohol and heat together over a water bath, to perfect solution. Perfume with any desired essential oil. Add animal charcoal and filter when the whole is cold. Thus is obtained a liquid, marking 30° B., which lathers readily with water.

Essence de Savon d'Italie, à la Rose.—

White soda soap	10 parts.
Alcohol, 34° B.	34 parts.
Rose water	34 parts.

Digest at a mild heat and filter. If orange flower water is substituted for rose water, an essence of corresponding odor is obtained.

Eukesis or Essence of Soap (for shaving).—Shaving cream, 9 oz.; liquor potassa, 3 drm.; sweet oil of almonds, ¾ oz.; alcohol, 60°, 1½ pt.; oil of pimento, ¾ drm.; oil of almond (essential), 1½ drm.; oil of bergamot, 3 drm.

Extract of Soap.—Soap, 14·3 parts; anhydrous soda, 30 parts; water, 55 parts. Manufactured from soda crystals and soda soap.

Family Soap.—Soda lye of 30° B., 2,500 parts; cocoa nut oil, 3,125 parts. Perfume with oil of cassia, 5 parts; oil of bergamot, 5 parts; oil of lemon, 2½ parts; sassafras, 2½ parts.

Savon aux Fleurs d'Italie—White tallow soap, 20 lb.; perfume with oil of citronella, 1½ oz.; oil of geranium, ½ oz.; oil of verbena, 1 oz.; oil of mint, 2½ drm. Color with brown ocher, 2½ oz.

Floating Soaps.—Floating soaps can be prepared according to various methods, of which two will suffice—the preparation from fresh materials and the preparation from trimmings from cocoa nut oil soap. This latter will probably give a very welcome opportunity to many manufacturers to advantageously dispose of the heaps of trimmings often left over.

The following is a formula for preparing a white floating soap from fresh materials. The color of the soap will of course depend largely on the quality of the oil used:

Cocoa nut oil	88 lb.
Soda lye, 38° B	46·2 lb.
Potash lye, 25° B.	2·2 lb.

Melt the cocoa nut oil in the usual manner, filter into capacious jacketed kettle, or one placed in a water bath, and heat to about 122°

F. Then add the lye, stir well for about ten minutes, and then cover up the kettle. Allow to saponify and then thoroughly stir again. The soap will now have the appearance of fine woolly grains.

In the foregoing process but little fire or steam is necessary. Twenty-two pounds of well warmed calcium chloride solution of 20° B. and 88 lb. of hot water are now gradually added, with constant stirring to the curd in the kettle. The soap is worked up thoroughly to complete solution, but very little heat is required, as it is not necessary to make the soap boil.

After obtaining complete solution take a lye cylinder full of the soap solution from the kettle, allow it to cool to 77° F., and sink a lye hydrometer in the liquid, when this will indicate a density of 50° B. This particular degree will yield a floating soap having a medium weight.

The soap solution is then allowed to cool to 77° F., and a stirring kettle filled about ⅓ full with the cooled soap. This aqueous fluid mass is then stirred vigorously until transformed to a stiff foam and is then put into the flames at once.

The prescribed temperature of 77° F. must be carefully adhered to, for if heated to a higher temperature, say 100° F., or over, much more time will be required to work up the liquid into a permanent foam, and through the long stirring the foam would be so puffed out that the resulting soap would be too light. On the contrary, if allowed to cool too much, the soap obtained will be too heavy, because the formation of the foam takes place too rapidly, and the soap is not allowed sufficient time to swell in the kettle.

Floating soap should not be dried in a warm room nor in a drying oven, as, if this is done, the soap will shrink a great deal and become fissured. It is better to allow the entire block as it comes out of the form to stand for several weeks in an airy light place, then cut into tables, allow them to dry for several days, and then cut up into bars or cakes.

Another process, that of making floating soap from trimmings, is quite simple. For instance, place 220 lb. of the trimmings or scraps from cocoa nut oil soap in a jacketed kettle or on a water bath. To dissolve this about 33 lb. of potassium chloride solution of 20° B., and about 132 to 154 lb. of water should be added to the scraps in the kettle, the quantity of solution and water required being of course dependent on the degree to which the scraps have dried out.

Considerable heat is applied at first and the scraps diligently broken up to facilitate their solution. Strips and cubes of soap should have previously been passed through a planing machine. When very old dry scraps are used, it will frequently prove very difficult to effect their solution. In this case solution can be accelerated by strewing over the above quantity of soap from 2 to 4½ lb. of salt.

The trimmings of cocoanut oil soap mentioned in the above process should not be from filled soap, as such, filled for instance with water glass and soda crystals, are not suitable for floating soap. The material used for filling renders the soap brittle and coarse, and when cut and planed the surfaces of the bars and cakes do not become smooth. When used in too large quantities, salt causes the same result in floating soaps. These filling solutions have also an influence when measuring the degree of density of the soap solution.—*Chem. Trade Journal.*

2. Good oil soap, 14 lb.; water, 3 pt. Melt together by aid of steam or water bath, and assidiously beat together until the mixture has at least doubled its volume. The capacity of the pan for 14 lb. of soap should be about 18 gal. Frame and cool. The thickness of the soap in the frames should not be more than 6 or 7 in. In about a week or less it will be ready for cutting. Perfume as desired. Color with ½ to 1 drm. of vermilion per lb.

3. Good oil soap, ½ cwt.; water, ½ gal. Melt by the heat of a steam or water bath in a pan furnished with an agitator, which must be assidiously worked till the soap has at least doubled its volume, when it must be put into the frames, cooled and cut into pieces. Lathers well and is very pleasant. Any scent may be added.

4. Olive oil or almond oil soap..... 5 lb.
Soft water..... 1¼ pt.

Expose them, in a bright copper pan, to a steam or water heat, and assiduously beat and agitate the mixture until it has more than doubled its volume, then pour it into a cold frame, cool it quickly, and, when hard, cut it into bars or cakes. It may be colored and scented at will. Floats on water, and lathers freely, but will not bear soaking or much wet, as it rapidly softens.

Frangipani.—Curd soap previously colored pink, 7 lb.; civet, ¼ oz.; otto of neroli, ½ oz.; otto of santal, 1½ oz.; otto of rose, ¼ oz.; otto of vitivert, ½ oz.

French Formulæ for Soaps.—The following formulæ represent some of the fatty combinations used in different localities in France in the manufacture of soap:

1. Olive oil	.675	lb.
Earth nut oil	.675	lb.
Lard	.900	lb.
	2,250	lb.

This produces a white, odorless soap.

2. Bleached palm oil	1,575	lb.
Oil of sesame	.450	lb.
White tallow	225	lb.
	2,250	lb.

Produces a very hard soap, of good quali but not so white as the above. It turns sligh yellow by keeping.

3. Olive oil	.450	lb.
White tallow	1,350	lb.
Earth nut oil	.450	lb.
	2,250	lb.

This is considered to form a very good soap, and superior to that of Marseilles, but unfortunately it has a faint smell of tallow, which restricts its use in domestic economy.

4. Olive oil	.675	lb.
Cocoa nut oil	225	lb.
Lard	.675	lb.
Tallow	.675	lb.
	2,250	lb.

This formula makes a good white soap, but the presence of cocoa nut oil gives the soap a disagreeable odor, although it improves its lathering properties.

Fulling Soap, or soap for cleansing and scouring woolen fabrics, is a soft soap of the composition of—

1. Fatty acids, 50·0; potash, 11·5; water, 38·5.
2. Fatty acids, 40·0; potash, 9·5; water, 50·5.

It should contain a slight excess of alkali, but no rosin, starch or silicate.

3. For use in woolen manufacture a genuine potash oil soap has been found in practice superior to all others. Resin gives harshness to the fiber of the wool, so must not be used. Soda also injures the suppleness of the wool, and should be discarded. The natural lubricant of wool, called suint, is a kind of potash soap, containing a bare trace of soda. Silicates also must not be used; if present they are decomposed in the process of fulling, and deposit free silica, which grates on the fiber and injures its luster.

Fuller's Earth Soap.—Curd soap, 10½ lb.; marine soap, 3½ lb.; fuller's earth (baked), 14 lb.; otto of French lavender, 2 oz.; otto of origanum, 1 oz.

Gall Soap.—1 kilo. of galls is stirred in 25 kilos. of melted cocoa nut oil, and saponified, cold, with 22½ kilos. of soda lye (38° B.). Color with 350 grm. ultramarine green. Perfume with 75 grm. lavender oil and 75 grm. cummin oil.

Glycerine Soap.—1. Melt any mild soap, and mix glycerine intimately with it, in the proportion of ⅛ to ⅓ of the weight of the soap, to form plain glycerine soap.

Perfume with oil of bergamot or rose geranium, mixed with a little oil of cassia, to which sometimes a little oil of bitter almonds may be added.

2. Tallow (mutton)	44	lb.
Cocoa nut oil	44	lb.
Castor oil	22	lb.
Glycerine (pure)	22	lb.
Caustic lye, 40° B.	27	lb.
Alcohol 96°	48·4	lb.
Water	9·9	lb.

Melt the grease at 104° F., and add the alkali by slow degrees, keeping the heat low to prevent evaporation, and stir constantly. When the lye has become absorbed, after three or four hours' stirring, add the alcohol, which should be warmed; stir until it becomes clear, then add the glycerine, and when mixed, the water and perfume.

3. Liquid Glycerine Soap.—Oleic acid, 187 lb.; cocoa nut oil (best), 33 lb.; potash lye, 35° B., 114 lb.; glycerine, 10 lb. The ingredients are saponified at a gentle heat, and sufficient alcohol at 95° added to make the soap clear.

4. Transparent Glycerine Soap.—Twenty lb. fresh tallow and 10 lb. best cocoa nut oil are heated at 167° F. On the other hand, 15 lb. of solution of caustic soda, 40° B., or sp. gr. 1·384, 12 lb. of 96% alcohol, 15 lb. of glycerine, 6 lb. of brown sugar, and 2 lb. of water are mixed, likewise heated to 167° F., and the mixture gradually mixed with the former, under brisk stirring. Saponification takes place in this manner, without the necessity of boiling. The reaction is accompanied by a considerable increase in bulk. It may then be covered, and after it has become a little cooler, it may be scented; finally, it is transferred to moulds, which must be so placed that the soap can congeal quickly.—*New Remedies.*

Grease, to Preserve.—To preserve soap grease, fill a cask half full of good strong lye and drop all refuse grease therein. Stir up the mixture once a week.

Bordhardt's Herb Soap.—

Olive oil soap	30	lb.
Palm oil soap	20	lb.
Dextrine	2	lb.

Perfume with—

Oil of rosemary	2	oz.
Oil of lavender	1½	oz.
Oil of thyme	1½	oz.
Oil of sage	1	oz.
Oil of magnolia	1	oz.
Oil of peppermint	1	oz.

Color blue.

Honey Soap.—White Marseilles soap, 4 oz.; honey, 4 oz.; benzoin, 1 oz.; storax, ½ oz. Mix well in a marble mortar. When thoroughly mixed, melt over a water bath, pass through a fine sieve, and run into moulds. Divide into cakes.

The article commercially vended under this name rarely contains any honey. It may be prepared as follows:

Palm oil soap and olive oil of each 1 part, curd soap 3 parts; melt together.

Perfume with oil of verbena, rose geranium or ginger grass.

2. Or, a neat yellow soap is mixed with 5% sodium carbonate, or silicate (59½° B), the whole crutched, and perfumed with oil of citronella.

Ichthyol is another preparation, which, having earned a great reputation in the same class of remedies, has also been largely used as soap, containing 5% of the sodium sulphichthyolate. In this form ichthyol displays effectively its great power over affections due to or associated with a dilated condition of the vascular system. The soap is particularly prescribed in the treatment of eczema and rosacea. It has been found to exert a marked beneficial influence upon redness of the skin, and particularly the condition known as red nose. The latter property is also ascribed to a soap containing camphor (about 5%), which is a mild stimulant to the skin.

Iodine Soap.—1. Make a solution of 1 part of iodine of potassium in 3 parts of water; to this add, of pounded Castile soap, 16 parts; melt in a porcelain vessel by the aid of a water bath.

2. Castile soap (sliced), 1 lb.; potassium iodide, 1 oz.; dissolved in 3 fl. oz. of water; melt them together in a porcelain vessel over a water bath.

3. Ten kilos. cocoa nut oil, 5 kilos. lye (38° B.), and 1½ kilos. of potassium iodide, dissolved in ½ kilo. of water.

Labor Saving Soap.—To make it, take 2 lb. sal soda, 2 lb. yellow bar soap, 10 qt. water, or in like proportion. Cut the soap into thin slices and boil all together two hours and then strain through a cloth into a tight box or tub; let it cool and it is fit for use. Do not let it freeze.

To use it, put the clothes to soak the night before you wash. The next morning put your water into your kettle or boiler. To every two pails of water, add about one pound of the soap. As soon as the water with its dissolved soap begins to boil, wring out the clothes from the water in which they had been at soak during the night, and put them into the boiling water without any rubbing. Let them boil one hour, then suds and rinse them and they will be clean and white. They will need no rubbing except a little on such places as are soiled, and for that no wash board will be required. The clothes should be rinsed in two waters.

Colored and woolen clothes must not be boiled as above, but may be washed in the suds weakened with water. The clothes will last longer by the use of this soap and much labor will be saved.

Six pounds of sal soda, 6 lb. bar soap, and 30 qt. water will make about 50 lb. of the soap. The soda costs about eight cents a pound and the bar soap eight cents a pound.

A pint measure will hold a pound of the labor saving soap. This will save the trouble of weighing every time.

Lard Soap.—This soap is prepared by the cold process as follows: Melt 112 lb. lard by gentle heat and add half the lye prepared by dissolving 56 lb. caustic soda to mark 36° B. Agitate well without allowing the mixture to boil, and when it is thoroughly incorporated the remainder of the lye is gradually introduced. The temperature is kept under 149° F. When the paste has sufficient consistence and has no greasy feel when pressed between the fingers, it may be pressed into frames. The desired perfume is added while the soap is in the pasty state. In about two days it will have become sufficiently solid to be cut into tablets and pressed. This soap is very hard and of a brilliant whiteness.

Laundry Soaps.—Soap to Clean Clothes Without Rubbing.—Take 2 lb. sal soda, 2 lb. yellow bar soap and 10 qt. water. Cut the soap in thin slices, and boil together 2 hours; strain, and it will be fit for use. Put the clothes in soak the night before you wash, and to every pailful of water in which you boil them add 1 lb. soap. They will need no rubbing, but merely rinsing.

Soap Leaves are prepared by passing continuous paper sheets over rollers through a hot solution of soap, the excess of soap attached to the surface being scraped off. The paper is

then passed over drying cylinders and from thence to a cutting machine.

Lemon Soap.—

White soap	50	lb.
Starch	2	lb.
Perfume with—		
Oil of lemon	4	oz.
Oil of bergamot	2	oz.
Oil of lemon grass	2	oz.
Oil of cloves	1	oz.

Color light yellow with cadmium yellow.

Lettuce Soap.—

Lard with lettuce	20	lb.
Cassia pomade	10	lb.
Spermaceti	5	lb.
Castor oil	5	lb.
Palm oil (bleached)	10	lb.
Caustic ley, 36° B	26	lb.
Gum tragacanth	3	oz.
Perfume with—		
Oil of bergamot	6	oz.
Oil of thyme	2	oz.
Oil of valerian	1	oz.
Oil of cloves	1	oz.

Color, light green. The lard with lettuce is made by melting the lard with its own weight of lettuce leaves, keeping it at the melting point, about 90° F., for some hours or until the leaves have parted with their color and juice. Then steam off for use.

Lily Soap.—Wax soap, 1,500 parts; starch, 150 parts; oil of bergamot, 8¼ parts; oil of sandal wood, ¼ part; oil of geranium, 3¼ parts; oil of cassia, ¾ part; tincture of musk, 1½ part; tonka bean, 1½ part; tincture of storax, 5 parts.

Liquid Soaps (Kingzett's).—Kingzett prepares liquid soaps for employment as insecticides by dissolving rosin or crude turpentine in alcohol, and saponifying with potash. To this is added an alcoholic solution of a fatty acid soap and various disinfectants. Or, crude turpentine, or rosin may be dissolved in sanitas oil, or rosin spirit, or rosin oil, and then saponified by caustic alkali solution of sp. gr. 1·300. Camphor is added to insure a permanently liquid product, and this may be medicated by addition of thymol, etc. Or, petroleum spirit, or thymol, may be used instead of, or in conjunction with, the sanitas oil mentioned in the last patent.

Lubricating Soap.—Tallow, 1½ part; crude palm oil, 3 parts; solution carbonate of soda, 15°, 1½ part; melt.

Macquer's Acid Soap.—Castile soap, 4 oz.; soften by heat and a little water; add oil of vitriol, q. s., continually triturating the mass in a mortar. Detergent. Used where alkalies would be prejudicial.

Savon à la Marechale.—Lard with musk, 10 lb.; lard with amberette, 10 lb.; pomade (aux fleurs) cassia, jasmine and rose, of each 10 lb.; olive oil, 1 lb.; white wax, 2 lb.; gum tragacanth, 2 lb.; caustic ley, 36° B., 28 lb. Saponify carefully and color with a little caramel (burnt sugar).

Marine Soap.—Fuller's earth, 40 parts; calcined soda ash, 40 parts; cocoa nut oil soap, 80 parts, Used for washing in sea water.

Marshmallow Soap.—

1. White curd soap and palm oil soap, of each	40	lb.
Color with—		
Yellow ocher	4	oz.
Orange mineral	4	oz.
Gamboge	1¼	oz.
Perfume with—		
Oil of lavender	10	oz.
Oil of lemon	2	oz.
Oil of neroli	2	oz.
Oil of verbena	10	oz.
Oil of mint	3	oz.

Or, the following:

Oil of Portugal	6	oz.
Oil of thyme	4	oz.
Oil of lavender	1¼	oz.
Oil of cinnamon	2	oz.
Oil of cloves	3	oz.

This soap may be colored rose wich vermilion, or be left as a white soap if desired.

2. Palm soap, 25 lb.; half palm soap, 25 lb.; perfume with oil of peppermint, ¼ oz.; oil of lavender, 3 oz.; oil of lemon grass, 2 oz.; oil of petit grain, ¼ oz.

Medicinal.—See also *Carbolic, Salol, Ichthyol Sulphur, Boracic* and *Mercurial* soaps.

A series of medicinal soaps is made containing such essential oils as are possessed of antiseptic virtues. Among these may be mentioned wintergreen, pine and eucalyptus oils, while also thymol and terebene might be placed in the same class. The first three may, perhaps, be considered more as hygienic toilet than medicinal soaps; they are particularly suitable as preventives of freckles, pimples, tan, chaps, etc., and for improving the complexion. The thymol soap (2-5 per cent.) has been employed to sweeten suppurating wounds and ulcers, and to treat herpes and other allied diseases; it is a mild and agreeable antiseptic application.

Metal Cleansing Soap.—Cut in small pieces 2 lb. of cocoa nut oil soap; put in sufficient water to produce a thick, jelly-like mass when heated. Take 2 lb. red oxide of iron, mix with some water.

Metal Polishing Soap.—An excellent soap may be made by mixing together 69 parts of kieselguhr and 30 parts of soft soap, coloring the mixture with 1 part of Armenian bole. The powders should be finely levigated before mixing.

Mercurial Soaps are made by saponifying mercurial ointment. Thus, 10 oz. of mercury are gradually incorporated with 2 oz. of mercurial ointment, so globules are no longer visible with a lens, then 1 lb. 2 oz. of soap (powdered) are added, and 2 oz. of lard.

A soap can also be made to contain, say, 5 per mille of sublimate, which is useful in the treatment of secondary syphilitic eruptions, of scabies, and of parasitical affections. Being free from unpleasant odor, it is preferable to some other antiseptic soaps. A preparation of this kind would also seem to be useful for cleansing the coats of domestic animals.

1. *Sapo Hydrargyri.*—Dissolve 4 oz. of mercury in the same weight of nitric acid without heat; melt in a porcelain basin, over a water bath, 18 oz. of veal suet, and add the solution, stirring the mixture till the union is complete. To 5 oz. of this ointment add 2 oz. of solution of caustic soda (sp. gr. 1·33) till a soap is formed which is completely soluable in water.

2. *Sapo Mercurialis.*—Castile soap (in powder), 4 oz.; corrosive sublimate, 1 dr. dissolved in rectified spirit 1 oz.; beat to a uniform mass in a mortar.

3. *Sapo Hydrargyri Precipitati Albi* (Sir H. Marsh).—Beat 12 oz. of white Windsor soap in a mortar, add 1 drm. of rectified spirit, 2 drm. of white precipitate, and 10 drops of otto of roses; beat the whole to a uniform paste.

4. *Sapo Hydrargyri Precipitati Rubri* (Sir H. Marsh).—White Windsor soap, 2 oz.; nitrate of mercury (levigated), 1 drm.; otto of roses, 6 or 8 drops, in rectified spirit 1 to 2 drm.; beat to a paste.

5. Mercurial Soap is made from powdered Castile soap, 4 oz.; corrosive sublimate, 1 drm., dissolved in rectified spirit, 1 fl. oz. These ingredients are to be thoroughly mixed in a Wedgwood mortar.

6. Take of—

Corrosive sublimate (crushed small)	1	drm.
Rectified spirit (to dissolve, say)	1	fl. oz.
White Castile soap (in powder)	4	oz.

Beat them to a uniform mass in a Wedgwood-

ware mortar, adding a few drops of otto of roses or a mixture of the oils of cassia and bitter almonds. Nothing metallic must touch it. This is the *sapo hydrargyri bichloridi* of medical writers.

Mottled Soaps.—The mottled or marble appearance is usually given to soap, on the large scale, by watering the nearly finished soap with a strong lye of crude soda (preferably one rich in sulphides), by means of a watering-pot furnished with a rose spout. In Castile soap it is given with a solution of sulphate of iron used in the same way. On the small scale, with toilet soaps, the mottle is either given in the way noticed under Savonnettes, or, in a like manner, by combining some of the soap, colored at the time of scenting it, with the remaining uncolored portion.

The form of cakes, tablets, etc., may be given by either pouring the semi-liquid soap into a series of polished metal moulds or by cutting and moulding or stamping the soap in the solid state, it having been previously cut or formed into bars of suitable size and length.

Mottling.—If, instead of a white soap, the object is to produce a mottled soap, impure soda, containing sulphides, is preferred for the lye, and a quantity of ferrous sulphate (green vitriol), about 8 oz. for each cwt. of oil, is added at the end of the preliminary boiling. This is at once precipitated, partly as iron oxide and sulphide and partly as an insoluble iron soap. In consequence of this addition and also from the presence of iron and sulphur in the lye, and of ferruginous matters from the pan, the curd obtained at the end of stage 3° has a uniform slate color. If this were allowed to remain, the effect would not be pleasing; but instead of directing his endeavors to exclude these impurities, as in the case of the white soap, the soapmaker conducts the operation in such a way as to preserve and arrange them by diffusing the color in veins, in order to give a marbled or mottled appearance. When the proper consistence of the soap has been attained, the mass is worked about with rakes, so as to bring the lower and darker colored parts of the curd to the top. When this has been sufficiently done, the viscid soap is transferred to the frames, where, in about a a week or more, according to the quantity, it cools down to mottled soap. By varying the proportion of iron sulphate added, a tint is produced of a lighter or darker hue. By exposure to the air, the iron gets oxidized to the state of sesquioxide, and a reddish tint called manteau Isabelle is diffused over the bluish mottled mass.

It is thus apparent that in mottled soap the veins and patches of heavy, insoluble, colored compounds are present because, by special manipulation, they have been intentionally prevented from subsiding, and by the conveyance of the soap to the frames in so viscid a condition that the downward trickling of the colored impurities should proceed so slowly as only to intensify the desired appearance and not subside altogether. It is evident also that, if a soap so prepared were thinned by admixture with water, the impurities would more readily subside, and that the veining or mottling would be greatly diminished or entirely prevented. Hence, a genuine mottled soap cannot contain more than 33 or 34, or at most, 36% of water. Hence, also, as a mottled appearance was formerly a special characteristic of Castile soap, and as this was essentially a good soap, a mottled or marbled character came to be regarded as a sign of excellenee. So far was this belief carried, that it used to be said there was no need to analyze a marbled soap, as it must necessarily be genuine. This, however, is now by no means the case.

Artificial Mottled Soaps, Blue, Gray and Red.—Blake & Maxwell's process may be used to produce these soaps. Two soap pans are required. In one of these a known quantity of tallow, or bleached palm oil, or a mixture of 80% of cocoa nut oil, 14% of tallow and 6% of lard, is boiled with a quantity of soda lyes, carefully calculated with reference to the fats, and the hydrated soap thus formed is transferred to the other pan, in which a soft curd soap has been prepared from fatty matters and lyes, as calculated by the sttength of the alkali. The mottle is produced by adding to this soap, when in a finished state, coloring matter to impart the desired color, and in about half an hour after the soaps and coloring matter have been thoroughly incorporated, the soap may be transferred to the frames. For the best descriptions of mottled soaps the weight of fatty matters used to produce the hydrated soap amounts to from one fourth to one half the fat used to produce the soft curd. For cheaper descriptions, the hydrated soap may be increased till the proportion of fat in the hydrated soap amounts to from two thirds to one and a half times the weight of fat in the curd soap.

Another way is to prepare a fitted soap from the fatty mixture containing cocoa nut or palm kernel oil in one pan and to remove it from the nigre to the second pan. Here, for every 1,000 lb. of soap, are added 250 lb. of sodium silicate, and the whole is thoroughly incorporated by boiling, until the experienced workman judges that the proper condition for mottling has been attained. The coloring matters mixed with water are then sprinkled into the pan, and after boiling for a few minutes, the mixture is transferred to the frames.

The coloring matters are—for blue, artificial ultramarine, 5 to 10 lb. per ton; for gray, manganese oxide, 1 to 3 lb. per ton; and for red, vermilion.

Musk Soap.—

1. White curd soap.....60 lb.
   Palm oil soap.....40 lb.

Color with—

   Brown ocher, or Spanish brown. 8 oz.

Perfume with—

   Oils of musk and bergamot, of each..... 7 oz.
   Powder of cloves, pale roses, and gilliflower, of each..... 9 oz.

2. White tallow soap, 5 kilos.; pure palm soap, 5 kilos. Perfume with oil of bergamot, 50 grm.; oil of roses, 5 grm.; oil of cloves, 5 grm.; oil of musk, 10 grm. The musk is prepared thus: Pound 10 grm. of musk in a mortar, with an equal weight of sugar and 5 grm. of pure potash; then add 160 grm. of alcohol, gradually triturate for a quarter of an hour, pour the mixture into a flask, and leave from 2 to 4 weeks, shaking it from time to time. Then filter, add the whole of the filtrate to the 10 kilos. of soap, and afterward the other perfume. Color with 80 grm. brown ocher.

3. Best tallow soap, 30 lb.; palm oil soap, 20 lb.; powdered cloves, pale roses, and gilliflowers, of each, 4½ oz.; essences of bergamot and musk, of each 3½ oz.; Spanish brown, 4 oz.; mix as soap à la rose. Very fine.

Tonquin Musk Soap.—

   Pale brown colored curd soap... 5 lb.
   Grain musk ..... ¼ oz.
   Otto of bergamot..... 1 oz.

Rub the musk with the bergamot, then add it to the soap and beat up. Should be made six months before using.

Naples Soap, Liquid.—Take 12 lb. shavings of good white soap, and melt in 2 or 3 qt. of rose and orange flower waters. Add, to retain its liquidity, 2 lb. of oil aux fleurs, slightly boil the mixture, put in 4 oz. powdered bergamot, peel for coloring, then strain and perfume as for the soaps in tablets. In default of oil, when the soap is melted, add 2 quarts of good essence of soap; leave it for 15 minutes to thoroughly incorporate, and then strain and perfume.

If by age it becomes dry, moisten with a little rose or orange flower water. The liquid soaps are susceptible of every variety of perfume.

Oatmeal Soap.—

White soap	25	lb.
Half palm soap	10	lb.
Cocoa nut oil soap	6½	lb.
Oatmeal (coarse ground)	6	lb.

Olein Soaps.—

1. Saponified oleic acid	150	lb.
Tallow	40	lb.
Crude palm oil	10	lb.
2. Saponified oleic acid	155	lb.
Crude palm oil	10	lb.
Cotton seed oil	20	lb.
Linseed oil	15	lb.

Omnibus Soap.—

Cocoa nut oil	40	lb.
Lye of 20° B.	55	lb.
Common salt	3	lb.
Potash	3	lb.

Perfume with oil of mirbane.

Orange Soap.—

White soap	50	lb.
Starch	2	lb.

Perfume with—

Oil of orange peel	8	oz.
Oil of cinnamon	½	oz.
Oil of thyme	2	oz.

Color dark yellow with naphthaline yellow.

Orange Flower Soap.—

1. White curd soap	60	lb.
Palm oil soap	40	lb.

Color with—

Yellow green pigment	16	oz.
Minium (red lead)	2⅛	oz.

Perfume with—

Oil of Portugal	15	oz.
Oil of ambergris	15	oz.
2. Tallow soap	80	lb.
Palm oil soap	20	lb.
Essence of Portugal	7½	oz.
Essence of ambergris	7½	oz.
Yellowish green color (ocher and indigo)	8¼	oz.
Vermilion	1¼	oz.

Mix as soap à la rose. Very fine.

Ox Gall Soap.—1. Mix together 1½ kilo. ox gall with 25 kilos. melted cocoa nut oil. Saponify this mixture by the cold process with 12½ kilos. caustic soda lye of 38° B. The soap may be dyed by the addition of 850 grm. of ultramarine, and, if desired, perfumed with a mixture of 75 grm. of lavender oil and 75 grm. of caraway seed oil. Ox gall soap is useful for scouring woolen goods.

2. Purified ox gall	1	part.
White curd soap	2	parts.

The soap is cut into shavings and melted in the ox gall at a moderate heat, evaporating until of proper consistency. The ox gall is prepared by boiling it with 10 to 12 parts of wood spirit and straining.

Savon de Palme.—

Palm oil	10	lb.
Half palm soap	10	lb.

Perfume with—

Oil of bergamot	2	oz.
Oil of cloves	½	oz.
Oil of cinnamon	1	oz.
Oil of lavender	1	oz.

Dresden Palm Soap.—

Cocoa nut oil	3,520	lb.
Palm oil (crude)	1,100	lb.
Resin	880	lb.
Soda lye, 28°	353	lb.

Melt together the fats and saponify the resin separately, taking care to add the resin soap before it becomes too thick to stir.

Half Palm Soap may be made from either of the following formulas:

1. White tallow	900	lb.
Palm oil	400	lb.
Cocoa nut oil	200	lb.
Yellow resin	100	lb.
	1,600	lb.
2. Tallow	700	lb.
Palm oil	300	lb.
Cocoa nut oil	200	lb.
Cotton seed oil	400	lb.
	1,600	lb.
3. Lard	550	lb.
Tallow	400	lb.
Cotton seed oil	450	lb.
Resin	200	lb.
	1,600	lb.

The following formulæ, recommended by Ott, may prove useful:

Palm oil	300	lb.
Tallow	200	lb.
Resin	20	lb.
	520	lb.
Tallow	500	lb.
Palm oil	300	lb.
Resin	200	lb.
	1,000	lb.
Palm oil	450	lb.
Cocoa nut oil	50	lb.
	500	lb.
Lard	550	lb.
Palm oil	150	lb.
Cocoanut oil	50	lb.
Clarified resin	50	lb.
	800	lb.

Violet's Palm Oil Soap.—One hundred lb. of palm oil are melted, and at the temperature of 203°, 12½ oz. nitric acid are added, with vigorous stirring for about a quarter of an hour; 12 gal. of hot water are then added, and the stirring continued, after which the oil is allowed to rest. The oil is then well washed several times to free it from the acid, and after being separated from the water is saponified with a weak lye at 8° B., followed by stronger lyes of 10° and 15°. The boiling is kept up until the soap is of the proper granular consistence, and the grained soap, after being separated from the lye, is dissolved with lemon juice. This soap is called orangine.

Patchouly Soap.—

Curd soap	4½	lb.
Otto of patchouly	1	oz.
Otto of santal	¼	oz.
Otto of vitivert	¼	oz.

To Deodorize Fat for Making Perfumed Soap.—Boil 80 lb. of fat with 28 lb. water, containing 5 oz. common salt, and 2¼ oz. powdered alum. Boil for ten minutes. Strain off the water, and let the fat remain several hours before using.

Soap Poultice.—Any mild soap (scraped or sliced) dissolved in four times its weight of boiling water, and the solution thickened with crumb of bread or linseed meal. A popular application in scalds and burns.

Borax Soap Powder.—

Curd soap in powder	5	parts.
Soda ash	3	parts.
Sodium silicate	2	parts.
Borax (crude)	1	part.

Each ingredient must be first thoroughly dried, and all mixed together by sieving.

Castile Soap.—Cut or sliced small, dried by exposure to a warm dry atmosphere, and then powdered. Used as a hand, shaving, and tooth powder; also in dispensing. As a cosmetic it may be scented at will. As the first two, any of the other toilet soaps may be substituted for Castile soap.

London Soap Powder.—

Yellow soap	6	parts.
Soda crystals	3	parts.
Pearlash	1½	part.
Sodium sulphate	1½	part.
Palm oil (bleached)	1	part.

These ingredients are mixed as well as possible without any water, spread out to dry, and then ground into coarse powder. The palm oil imparts an agreeable odor.

Pearl Soap Powder.—

Curd soap (powdered)	4	parts.
Sal soda (crude sodium carbonate)	3	parts.
Sodium silicate	2	parts.

Dried as much as possible, and intimately mixed.

Soap Powder, Perfumed à Toute Odeur.—The preceding powder, when melted, is perfumed to any odor desired; for instance, to answer the above title:

Soap	6	lb.
Essence of bergamot	4	oz.
Essence of lemon	1	oz.
Essence of Portugal	½	oz.
Essence of anise or fennel	½	oz.

Powder of Savon Onctueuse.—After having frotted the soap, cut into thin slices. These, when perfectly dry, are powdered and sieved. This is lighter, and lathers more freely than some soap powders.

Powdered Soaps.—All hard soaps may be reduced to a fine powder, when perfectly dry, by trituration with a pestle and mortar, but the operation is generally confined to cosmetic soaps for shaving or other toilet purposes. The soap, being previously perfumed in the usual way, is cut into thin shavings, and these are laid upon sheets of paper and placed in the drying room, or dried in any convenient way. As soon as the shavings become brittle they are in a condition for powdering. Small quantities at a time should be carefully reduced to a powder in a mortar, and the powder afterward passed through a fine sieve, the fine powder being placed in a jar and kept well covered. All coarser particles retained by the sieve should then be pulverized and sifted as before, until the entire quantity is reduced to a powder fine enough to pass through the sieve.

Powder of Windsor Soap.—Take of very white and dry Windsor soap, powdered and finely bolted, melt it over a water bath with but very little water, so that it will dry the sooner, and be less liable to be soiled in mixing. When melted, transfer to frames; and when cooled, divide it into bars; these, when dry, are to be powdered.

Washing Powder.—A powdery mixture of 90 parts effloresced soda with 10 parts sodium hyposulphite and 2 parts borax.

Wool Washing Composition.—

Dried soda	35	parts.
Powdered soap	10	parts.
Sal ammoniac	10	parts.

Universal Washing Powder.—Sodium silicate, with a small perentage of soap and starch powder.

Pumice Soap.—

Ceylon cocoa nut oil	2	lb.
Soda lye of 40° B.	1	lb.
Pulverized pumice stone	1¼	lb.

Perfume with—

Oil of thyme	¼	oz.
Oil of bergamot	1	drm.

Rice Soap.—

Wax soap	1,350	parts.
Starch	200	parts.
Oil of geranium	1½	part.
Essence of Portugal	2½	parts.
Oil of bergamot	2½	parts.
Essence mirbane	1½	part.
Tincture benzoin, colored white or red	¼	part.
Cinnabar	4	parts.

Rosin Soap (Altenburge).—

Rosin	225	lb.
Cocoa nut oil	225	lb.
Soda lye, 28°	371¼	lb.

Use the cold process, and before putting in the frames cut with a salt lye of 24° B.

Rypophagon Soap.—A mixture of equal parts of pale yellow soap and a fig soft soap, which has been perfumed with anise.

Rose Soap.—

1. White soap 25 lb.
   Cocoa nut oil 25 lb.
   French vermilion 6 oz.

   Perfume with—

Oil of bergamot	2	oz.
Oil of cinnamon	½	oz.
Oil of rose	1½	oz.
Oil of cloves	½	oz.
Oil of neroli	½	oz.

2. New olive oil soap, 30 lb.; new tallow soap, 20 lb.; reduce them to shavings by sliding the bars along the face of an inverted plane, melt in an untinned copper pan by the heat of steam or a water bath, add 1½ oz. of finely ground vermilion, mix well, remove the heat, and when the mass has cooled a little, add essence of roses (otto?), 3 oz.; do. of cloves and cinnamon, of each 1 oz.; bergamot, 2½ oz.; mix well, run the liquid mass through a tammy cloth, and put it into the frames. If the soaps employed are not new, 1 or 2 qts. of water must be added to make them melt easily. Very fine.

3. Rose Leaf Soap.—

Rose pomade	20	lb.
Lard	20	lb.
Cocoa nut oil	10	lb.
White wax	2	lb.
Soda ley, 36° B	20	lb.
Potash ley, 30° B.	12	lb.
Gum tragacanth	8	lb.

   Perfume with—

Oil of roses	2	oz.
Oil of geranium	2	oz.
Oil of rhodium	1	oz.
Oil of bergamot	2	oz.
Oil of cinnamon (Ceylon)	½	oz.

   Color with aniline fast red, a light pink.

4. Otto of Rose Soap.—

Curd soap (previously colored pink)	4½	lb.
Otto of rose	1	oz.
Spirituous extract of musk	2	oz.
Otto of santal	¼	oz.
Otto of geranium	¼	oz.

   Mix the perfumes, stir them in the soap shavings, and beat together.

5. Rose or Savon à la Rose may be made from either of the following formulæ, the soap being previously well melted:

White curd soap made from best tallow	60	lb.
Olive oil soap	40	lb.
Vermilion in fine powder	3	oz.

   The vermilion is to be first well mixed with the soap, great care being taken to insure perfect incorporation. When the soap has cooled a little the following perfumes are to be added:

Essential oil of rose	6	oz.
Essential oil of cloves	2	oz.
Cinnamon	2	oz.
Essential oil of bergamot	5	oz.

Soap prepared from the above formula has a delicate rose color, is very fragrant and emollient, and is indeed one of the finest of toilet soaps.

6. White curd soap	100	lb.
Vermilion	10	oz.
Oil of rose	15	oz.
Oil of bergamot	5	oz.
Oil neroli	2½	oz.
Oil of cloves	5	oz.
Cinnamon	5	oz.
7. White tallow or lard soap	10	kilos.
Perfume, with oil of roses	40	grm.
Cloves	15	grm.
Cinnamon	10	grm.
Bergamot	30	grm.
Neroli	10	grm.
Or with oil of roses	25	grm.
Geranium	60	grm.
Cloves	15	grm.
Chinese cinnamon	10	grm.

Color with 60 or 80 grm. of vermilion.

Salol.—The soap is prepared in two stages, the first being the manufacture of the base. This is carried out as follows: One lb. of beef suet is melted with ½ lb. of cocoa nut oil and allowed to cool to 120° F.; then 14 oz. by weight of 18% caustic soda solution and 2½ oz. of 24% caustic potash solution are added and stirred together at a gentle heat for half an hour, or until a homogeneous mixture is formed. Perfume is now added, consisting of oil of caraway, 40 minims; oil of bergamot, 50 minims; oil of lavender, 30 minims; oil of thyme, 20 minims, and essence of mirbane, 6 drops. While the mass is still warm, 1 oz. of finely powdered salol is added, the whole heated sufficiently to melt the antiseptic (to 113° F.) and well stirred. It is then allowed to cool, cut into pieces of the desired size, dried partially in the air and wrapped in tin foil.

The salol soap powder is made by mixing 35 oz. of finely powdered stearine soap with 1 grn. of coumarin, 5 drops of oil of bergamot and 2 drops of oil of wintergreen; 2 lb. of this base are mixed with 1 oz. of finely powdered saloi.

Sand Soap.—1. 100 lb. of cocoa nut oil are saponified with about 200 lb. of lye at 20° B. The soap is then hardened by the addition of about 8 lb. of salt dissolved in water to a density of 15° B., with the addition of 6 to 8 lb. soda ash. The mixture is covered up and the foam allowed to subside. After standing five or six hours the foam is skimmed off and 100 to 150 lb. of dry, sifted sand is thoroughly crutched into the mass, and the crutching is continued until the soap is cool. This soap is very firm and hard.

2. Curd soap, 7 lb.; marine soap, 7 lb.; sifted silver sand, 28 lb.; otto of thyme, otto of cassia, otto of caraway, otto French lavender, of each 2 oz.

Sand Balls are made by incorporating with melted and perfumed soap certain proportions of fine river sand. About one third sand to two thirds soap is a fair proportion. The sand, however, should be passed *through* a fine sieve before using. Sometimes finely powdered pumice is substituted for the sand.

Sapolio.—Sapolio contains, besides organic matter, soda, iron, alumina, lime and hydrochloric, sulphuric, carbonic and silicic acids.

Savonnettes or Washballs.—These may be made of any of the milder toilet soaps or from the subjoined formulæ. The spherical form is given by pressing the soap in moulds, or by first forming them into balls with the hand, and when quite dry and hard turning them in a lathe.

The paste may be formed into balls by hand, and when quite dry finished by turning them on a lathe. They may be polished by rubbing with a cloth wet with a little spirit.

1. Curd soap in shavings | 3 | lb.
Finest yellow soap in shavings | 2 | lb.
Soft water | ¾ | pt.

Melt by gentle heat, and stir in powdered starch, 1½ lb. When the mass has considerably cooled, add essence of lemon or bergamot, 1½ oz. and make into balls.

2. Ordinary. Savonnettes Communes.

Curd soap, finest, in shavings	1½	lb.
Yellow soap, finest, in shavings	1	lb.
Soft water	½	pt.

Melt them together by a continued gentle heat, stir in—

Powdered starch or farina	¾	lb.

and when the mixture has cooled a little, further add—

Oil of bergamot	½	fl. oz.
Oil of lemon	½	fl. oz.
Essential oil of almonds	1½	fl. drm.

and thoroughly incorporate the whole. When the mass, by cooling, has acquired the proper consistence, at once form it into balls.

Savonnettes of Camphor.—

White curd soap	3	lb.

Melt, with the addition of a little water, and then add—

Spermaceti	4	oz.
Camphor, cut small	2	oz.

These are first to be melted together, and then added to the liquid soap.

2. Camphor. — Melt spermaceti, 2 oz.; add camphor, cut small, 1 oz.; dissolve and add the mixture to white curd soap, 1½ lb., previously melted by the aid of a little water and gentle heat, and allowed to cool considerably. These balls should be covered with tin foil.

Savonnettes of Sweet Herbs. — Melt 12 lb. white curd soap, and then add the following mixture of essential oils:

Oil of lemon	4	oz.
Oil of bergamot	4	oz.
Oil of thyme	1	oz.
Oil of lavender	1	oz.
Oil of wild thyme	1	oz.
Oil of myrtle	1	oz.
Oil of marjoram	1	oz.
Oil of mint	½	oz.
Oil of sage	½	oz.
Oil of wormwood	½	oz.
Oil of fennel	2	oz.

Savonnettes au Miel (Honey Savonnettes).—

White curd soap (melted)	1	lb.
Honey	1	lb.
Essential oil of any kind required	2	oz.
Rose water	2	oz.

Add the honey to the melted soap; then add the rose water, and lastly the perfume.

Honey.—Finest yellow soap, 7 lb.; palm oil, ¼ lb. Melt and add oil of verbena, rose geranium or ginger grass, 1 oz.; or oil of rosemary, ½ oz.

Honey Savonnettes.—

Finest yellow soap	7	lb.
Palm oil soap	¼	lb.

Melt and then add—

Oil of verbena, rose, geranium, or ginger grass	1	oz.
Oil of rosemary	½	oz.

Mottled Balls.—Cut the soap (recently prepared, and not too dry) into dice, or small square pieces, roll them in colored powder (see below), and then mould them into balls by powerful pressure, observing to mix the colors as little as possible.

The colors usually employed, and which should be in very fine powder, are:

1. *Blue.*—*Indigo*, powder blue, or smalts.

2. *Green.* — Powder blue and bright yellow ocher.

3. Orange. — Yellow deepened with a little red.

4. Red. — Red bole, sesquioxide of iron, or jewelers' rouge.

5. Yellow. — Bright yellow ocher or Dutch pink.

By varying the color, by diluting it with a little farina or chalk, and by using soap dice separately coated with two or more colors, mottled *savonnettes* of any color, or mixture of colors, may be produced at will.

Savonnettes of neroli.—

Melted curd soap	12	lb.
Orris powder	1	lb.
Orange powder	3	oz.
Oil of neroli	12	drm.
Essence of musk	4	oz.
Essence of ambergris	4	oz.

Sand Balls.—1. These are prepared by adding to the melted soap about half its weight of fine siliceous sand. Sifted Calais sand is usually employed. Some persons prefer the shelly sea sand (sifted from the shells and well washed) for the purpose. For the finer qualities, finely powdered pumice stone is now usually employed. Used to prevent roughness and thickening of the skin in cold weather; also to clean the hands when dirty. The best yellow soap, with or without the addition of ⅛ its weight of white soft soap and a little sweet oil, is the best for these balls.

2. Soap (at will), 2 lb.; fine sand, 1 lb.; perfume if desired. For finer qualities, finely powdered pumice stone is substituted for sand.

Savonnettes à la Vanille.—

White curd soap	12	lb.

Melt, with a little water, and then add the following mixture.—

Tincture of vanilla	4	oz.
Balsam of tolu	4	oz.
Balsam of Peru	2	oz.
Tincture of cinnamon	1	oz.
Oil of cloves	2	drm.
Tincture of musk	1	oz.
Tincture of amber	1	oz.

Violet Balls.—Take of—

Palm oil soap	1½ lb.
Yellow soap (best)	¾ lb.
Farina	½ lb.
Powdered orris root	¼ lb.

Scouring Balls.—

White curd soap	35	lb. 2 oz.
Pearlash	6	lb. 6 oz.
Oil of juniper	3	lb. 3 oz.

Mix together, having previously added a little water to the soap and pearlash to dissolve them by a moderate heat; add the oil of juniper and mould into balls.

Scouring Soap.—Dissolve in alcohol, 9½ oz. Castile soap. Add the yelks of 8 eggs, 8 fl. drm. oil of turpentine.

Scouring Soap for Wine and Vinegar Stains.—

White soap	5	oz.
Oil of turpentine	2	fl.drm.
Ammonium chloride	50	grn.

Mix.

Shaving Paste.—

1. Naples soap	4	oz.
Powdered Castile soap	2	oz.
Honey	1	oz.
Essence of ambergris, Oil of cassia, Oil of nutmegs		of each, 5 or 6 drops.
2. White wax	¼	oz.
Spermaceti	¼	oz.
Almond oil	¼	oz.

Melt, and, while warm, beat in 2 squares of Windsor soap, previously reduced to a paste with a little rose water.

3. White soft soap	4	oz.
Spermaceti	½	oz.
Salad oil	½	oz.

Melt together and stir till cold. Scent at will.

When properly prepared, these pastes produce a good lather with either hot or cold water which does not dry on the face.

Shaving Soaps.—A very fine shaving soap solution may be made by taking ¼ lb. white Castile soap in shavings, 1 pint rectified spirit, ¼ pint water; perfume to taste. Put in a bottle, cork tightly, set in warm water for a short time, and agitate occasionally till solution is complete. Let stand, pour the liquid off the dregs, and bottle for use.

Hampel's Shaving Soap is made by his patented process as follows: Cleaned olein 6·6 per cent. is first mixed thoroughly with 13 per cent. of hot water; then 5·4 per cent. of soda ley at 25° is added, and the mass, which assumes the appearance of soft butter, is agitated until it becomes cold and is easily liquefied, when 12·5 per cent. of best white soap and 50 per cent. of boiling water are added. All these ingredients are to be well mixed together, and finally 12·5 per cent. of spirit at 90° is to be added and well incorporated with the mass. The compound is then to be covered, and allowed to rest for a while, after which it is filtered, and is then ready for use.

Windsor Soap for Shaving.—

Pure white tallow	20	lb.
Cochin China cocoa nut oil	10	lb.
Soda lye of 30° B.	17	lb.
Potash lye of 30° B.	3	lb.

Perfume with—

Oil of bergamot	1½ oz.
Oil of cummin	3¼ oz.
Oil of rosemary	¾ oz.
Oil of lavender	¼ oz.

Way's Silicated Soap.—To produce 100 lb. of soap the operator puts into the soap pan 11·5 per cent. of each, bleached palm oil and cocoa nut oil, and 36·6 per cent. of soda ley of 36° Tw. These ingredients are boiled till the soap becomes stiff, and there is then added 44 per cent. of solution of silicate of soda of 36° Tw. The boiling is now continued till the soap becomes thin and limpid, when 2·4 per cent. of common salt is thrown in, and the boiling continued for three or four hours, when the soap may be cleansed either at once or after it has been allowed to stand for a few hours. If open steam be used, it is best to have the silicate solution and the ley of greater strength than that mentioned, in proportion to the quantity of water which is condensed from such steam into the soap-pan.

Silver Soaps. See **Polishing,** *Soaps.*

Soft Soap, Medicinal, is made from pure olive oil saponified with a caustic ley made from pure potash. The ley is added gradually and cautiously to the oil during the boiling, and the greatest care taken to avoid an excess of alkali. When the mass assumes a transparent and gelatinous appearance, the addition of ley is stopped. The boiling is continued until the soap has acquired the proper consistence.

Analyses of Soft Soaps.—The following analyses may be useful as showing the composition of several well made soft soaps:

Good soft soap of London make: Potash 8·5 + oil and tallow 45 + water 46·5 in 100 parts.—*Ure.*

Thenard gives the composition of soft soap as: Potash, 9·5; oil, 44·0; water, 46·5 = 100.

Belgian soft or green soap: Potash 7 + oil 36 + water 57 = 100.—*Ure.*

Scotch soft soap: Potash 8 + oil and tallow 47 + water 45 = 100.—*Ure.*

Another well made soap: Potash 9 + oil and fat 34 + water 57 = 100.

An olive oil (Gallipoli) soft soap from Scotland consisted of potash with a good deal of carbonic acid, 10; oils, 48; water, 42 = 100.—*Ure.*

A rapeseed oil from Scotland consisted of potash 10 + oil 51·66 + water 38·33.

A semi-hard soap from Verviers, for fulling cloth, called *savon économique,* consisted of potash 11·5 + fat (solid) 62 + water 26·5 = 100.—*Ure.*

Domestic Soft Soap.—

Potash	7½ lb.
Grease	10 lb.
Water	37½ gal.

Dissolve the potash in part of the water, add ⅛ of the grease and heat. Mix in the remainder of the grease, put in a barrel and add the remainder of the water, a little at a time, for several days. Stir often. Ready for use in about 2 weeks.

Shaker Soft Soap.—Grease, 4½ qt.; strong lye made from wood ashes, 18 gal.; water, q. s. to make up to 45 gal.

Soft Soap, to make Hard.—Put into a kettle four pailfuls of soft soap, and stir in it, by degrees, about one quart of common salt. Boil until all the water is separated from the curd, remove the fire from the kettle and draw off the water with a siphon (a yard or so of India rubber hose will answer). Then pour the soap into a wooden form in which muslin has been placed. For this purpose a wooden box, sufficiently large and tight, may be employed. When the soap is firm turn it out to dry, cut into bars with a brass wire and let it harden. A little powdered resin will assist the soap to harden, and give it a yellow color. If the soft soap is very thin, more salt must be used.

Soft Soap with Potash.—To twenty pounds of clear grease take 17 pounds of pure white potash. Buy the potash in as fine lumps as it can be procured, and place it in the bottom of the soap barrel, which must be water tight and strongly hooped. Boil the grease and pour it boiling hot upon the potash; then add two Shaker pailfuls of boiling hot water; dissolve one pound of borax in two quarts of boiling hot water and stir all together thoroughly. Next morning add two pails of cold water and stir for half an hour; continue this process until a barrel containing thirty-six gallons is filled up. In a week, and even less, it will be fit for use. The borax can be turned into the grease while boiling, and also one pound of resin. Soap made in this manner always comes, and is a first rate article, and will last twice as long as that bought at the soap chandlers. The grease must be tried out, free from scraps, ham rinds, bones or any other debris; then the soap will be thick as jelly, and almost as clear.

Soap Solution, Clark's—Dissolve 5 grm. Castile soap in ½ liter of dilute alcohol 36%. Used to test the hardness of water.

Spermaceti Soap.—Curd soap 14 lb.; otto of bergamot, 2½ lb.; otto of lemon, ½ lb.

Sulphur Soap.—1. The best contain about 10% of very finely divided sulphur, and are perfumed, as the element gives a rather unpleasant smell to soap when used alone. Various combinations of tar, of naphthol or of iodides, etc., with sulphur, are also made, which are commended for various cutaneous disorders, pimples, comedones, freckles, etc.; sulphur, when continuously applied, tends to produce a clear and healthy complexion.

2. White curd or Castile soap (recent)	½ lb.
Flowers of sulphur (best; levigated)	1 oz.
90% alcohol (strongly colored with alkanet)	1 fl. oz.
Otto of roses (to strongly scent the mass)	q. s.

Beat the whole together, to a smooth paste, in a marble or wedgwood-ware mortar. This is Sir H. Marsh's formula. Recommended in itch and various other skin diseases. It is particularly serviceable, as a common toilet soap, to persons troubled with slight cutaneous eruptions. Its daily use tends to render the skin fair and smooth. The spirit and coloring may be omitted at will; and, as a toilet soap, only half the above quantity of sulphur is amply sufficient.

Camphorated Sulphur Soap.—12 kilos. cocoa nut oil, 6 kilos. of soda ley (38° B), 1 kilo. potassium sulphate, dissolved in ⅛ kilo. of water, 160 grm. camphor, which is to be dissolved in the melted cocoa nut oil.

Sir H. Marsh's Sulphur Soap.—White soap, 2 oz. and sublimed sulphur, ¼ oz., are triturated in a mortar, with 1 or 2 fl. drm. of rectified spirit, until a smooth paste is formed. The spirit should be first colored strongly with alkanet root. A few drops of otto of roses are added to give the soap an agreeable fragrance.

Tannin Soap.—1. Dissolve 30 lb. of tallow soap; add 2 lb. tannic acid and enough starch to form the mass into cakes.

2. Nine kilos. of cocoa nut oil are saponified with 4½ kilos. of soda lye; then 250 grm. of tannin, previously dissolved in alcohol, are put in, and the whole mixed. The soap is perfumed with 30 grm. Peru balsam, 10 grm. cassia oil and 10 grm. oil of cloves.

Tar Soap (Sapo Piceus).—

Tar	1	part.
Liquor potassæ	2	parts.
Soap (in shavings)	2	parts.

Beat them together till they unite. Action stimulant, in psoriasis, lepra, etc.

Medicated Tar Soap.—

Cocoa nut oil	20 lb.
Tallow	10 lb.
Juniper tar	5 lb.
Soda ley (40° B.)	15 lb.

Cleaver's Terebene Soap.—Mr. Cleaver combines with soap, while in a melted state, the substance known as terebene, whereby a disinfectant and antiseptic soap is produced. This substance is also combined with toilet creams, cosmetics, etc. The following proportions, which may, however, be varied at will, are said to give good results: For toilet soap, 4½ pt. of terebene are added to 112 lb. of soap. For household or laundry soap, he adds 6 pt. of terebene to 112 lb. of soap. The terebene is introduced into the soap in its liquid state, and thoroughly incorporated by stirring. The soap may be perfumed if desirable. The soap is known as terebene soap.

Teeth, Soap for.—Tooth Soap.—

Tallow soap	20 lb.
Pumice powder finely sifted	½ lb.
Prepared chalk	2 lb.
Starch	½ lb.

Aromatic Antiseptic Tooth Soap.—Castile soap, 1 lb.; finely powdered pumice, 1 oz.; thymol, 20 grn.; oil of wintergreen, 30 drops. Shave the soap into ribbons, beat it into a paste with a little water, and add first the pumice and next the thymol and wintergreen dissolved in a small quantity of alcohol.

Zalmon's Aromatic Mouth Soap.—One lb. of neutral soap, prepared from fat of the best quality, is dissolved in cold distilled water, about 3½ oz. finely sifted cuttle fish bone is added to the solution, and the whole evaporated at a gentle heat. When the desired consistency is nearly reached add ¾ of a drm. each of oil of peppermint, oil of sage, virgin honey and white vinegar, or oil of lemons. Mix the whole quickly by stirring, and pour into suitable moulds to cool. Coloring matter may be added as desired.

Textile Soap.—The firm of Trawitz, Duerinnger & Co., Strassburg, Alsace, manufacture a soap for use in the textile industry which it is claimed meets the highest requirements and perfectly replaces the best Marseilles soap. This Luetzelburg textile soap, as it is named, according to the analysis made in the laboratory of the *Seifensieder Zeitung*, contains:

Fatty acid	65·2%
Soda	7·6%
Water	27·2%
	100·0

The fat is completely saponified and the soap absolutely neutral, and therefore suitable for any purposes of the textile industry.

Soap for Silks and Printed Goods.—The late Professor Crace-Calvert, of Manchester, to whose indefatigable exertions in industrial chemistry manufacturers were indebted for much valuable information, suggested the following formulæ for soaps to produce the highest brightening effect upon the various shades of color:

For Madder Purples.—

Fatty matter	60·4%
Soda	5·6%
Water	34·0%
	100·0

For Madder Pinks.—

Fatty matter	59·23%
Soda	6·77%
Water	34·00%
	100·00

For bleaching raw silk, white olive oil soap is used on the Continent.

Oleic acid, saponified by potash lye, is a very suitable fatty material for making soft soap. The first potash lye should have a strength equal to about 20° B., and the soap may be finished with a stronger lye—from 25° to 28°

Soap for Textile Industries.—

1.	Tallow	80 lb.
	Cottonseed oil	80 lb.
	Bone fat	80 lb.
	Cocoa nut oil	100 lb.
	Caustic soda	75 lb.
	Salt	32 lb.
2.	Tallow	80 lb.
	Peanut oil	120 lb.
	Bleached linseed oil	40 lb.
	Palm kernel oil	120 lb.
	Caustic soda	80 lb.
	Salt	36 lb.
3.	Cottonseed oil	80 lb.
	Peanut oil	80 lb.
	Bone fat	80 lb.
	Palm kernel oil	120 lb.
	Caustic soda	80 lb.
	Salt	35 lb.
4.	Saponified oleic acid	100 lb.
	Tallow	40 lb.
	Palm kernel oil	60 lb.
	Caustic soda	40 lb.
	Salt	20 lb.

Soft Soap.—

1.	Tallow	65 lb.
	Crude palm oil	10 lb.
	Saponified oleic acid	75 lb.
	Cottonseed oil	40 lb.
	Bleached linseed oil	10 lb.
2.	Tallow	100 lb.
	Horse fat	100 lb.
	Saponified oleic acid	100 lb.
	Crude palm oil	20 lb.
	Cottonseed oil	80 lb.
3.	Tallow	8 lb.
	Bleached palm oil	6 lb.
	Saponified oleic acid	14 lb.
	Peanut oil	9 lb.
	Bleached linseed oil	3 lb.

Transparent Soap.—1. Soap when perfectly dry is readily soluble in warm alcohol, and advantage is taken of this chemical fact in the manufacture of transparent soap. To prepare transparent soap, either tallow, almond or soft soaps may be used, but in either case the soap must be rendered perfectly free from water. The soap is first cut into thin slices or shavings, and these are then dried over a water bath or by hot air. Equal parts by weight of the dried soap, and rectified spirit are put into a still, heated by a water bath. Only moderate heat is applied, otherwise the spirit would pass over without dissolving the soap. The soap is sometimes powdered in a mortar after drying, before treating it with the spirit, by which it becomes more readily dissolved. If it is desired to color the soap, any coloring matter soluble in alcohol may be employed. It is best to color the spirit before adding it to the soap. When the soap is completely dissolved, it is allowed to rest for an hour or two, after which the clear and transparent liquid is put into the frames in which it will solidify on cooling. When cold it is cut in pieces of any required size, and these are moulded in the same way as other toilet soaps. It does not acquire its characteristic transparency until after it has been exposed to dry air for a considerable time.

Any of the aniline colors, however, may be used for tinting the transparent soap, and are, indeed, well suited to this purpose.

Resin soaps are considered very suitable for making these soaps, and the presence of a fair proportion of resin undoubtedly favors the transparency and beauty of the substance.

Although transparent soaps are exceedingly pleasing to the eye, they do not possess the active detergent powers of ordinary soaps.

2. Brown's recipe for making transparent soap is as follows: One hundred lb. dry bar soap to be heated and melted; then pour in 25 lb. or more of melted sal soda. Agitate together at a low heat. Then add 100 to 125 lb. of glycerine; agitate, keeping up a moderate heat. Let settle; draw off into moulds or soap frames. When cold cut into bars and cakes.

3. Take of perfectly dry pulverulent white soap, 2 lb.; alcohol, 36° B., 3 qt.; heat gently together over a water bath and when the solution is complete, perfume and turn out into forms.

When cooled divide it into cakes one-third thicker than their designed size, so as to allow for contraction by evaporation.

Turpentine Soap, or Starkey's Soap, is prepared as follows: Take of Venice turpentine, oil of turpentine and carbonate of potash, of each equal parts; place these in a mortar (previously warmed) and triturate them together, adding a little water, until a homogeneous mass is formed; put it into a paper mould and after a few days cut the soap into slices and keep them in a well stoppered bottle.

Vanilla Soap.—1. White tallow soap, 10 kilos.; perfume with tincture of vanilla, 500 grm.; oil of roses, 5 grm. Color with 100 grm. of burnt sienna.

2.	Lard, with vanilla	30 lb.
	Cocoa butter	10 lb.
	Palm oil	10 lb.
	Caustic ley, 36° B	26 lb.
	Wax	2 lb.
	Starch	2 lb.
	Perfume with—	
	Tincture of vanilla	4 oz.
	Tincture of musk	2 oz.
	Tincture of ambergris	2 oz.
	Oil of rose	½ oz.

Lard with vanilla is prepared by adding the vanilla to the lard, 1 oz. to the lb., keeping it at a moderate heat for some days, then straining, etc.

3.	White curd soap	40 lb.
	Tincture of vanilla	2 lb.
	Oil of rose	2½ drm.
	Color with—	
	Burnt sienna	7 oz.

Vaseline Tar Soap.—Saponify 40 lb. of cocoa nut oil and 6 lb. of tar with 22 lb. of lye 40° B. Dissolve 4 lb. of yellow vaseline and stir in the soap, with 1 lb. lukewarm water.

Vaseline Soap.—Cocoa nut oil, 160 parts; vaseline, 20 parts; lye of 40° B., 76 parts; water, 4 parts.

Vegetable Soap, by Delteil, Paris.—

Farina of pistachio nuts	3 parts.
Beech nuts	1 part.
Buckwheat meal, orris, and patchouli	1 part.

The perfume of the product can be varied. It may be either essence of rose, almonds, bergamot, or musk.

Violet Windsor Soap.—

Lard	50	parts.
Palm oil	33	parts.
Spermaceti	17	parts.

The perfume employed is essence of Portugal, to which a little oil of cloves is added. The well-known violet odor of the palm oil, modified by the perfumes, gives an agreeable fragrance to the soap.

1. *Violet Soap* (Yellow).—

Yellow cocoa nut oil	20	lb.
Palm oil	20	lb.
Tallow	10	lb.
Soda lye at 36° B.	26	lb.
Powdered orris root	4	lb.

To which are added the following perfumes:

Oil of lemon	4	oz.
Oil of rhodium	2	oz.
Oil of thyme	2	oz.
Tincture of musk	4	oz.

Color with cadmium yellow.

2. Genuine Violet Soap.—Genuine violet soap, which is generally sold in square lumps, marked "Finest perfumed old brown violet soap," enjoys the greatest approval of consumers on account of its agreeable odor. It is certainly made in every large manufactory of toilet soaps, but there are great discrepancies as regards the manner of its manufacture and the composition of the scent.

Finest cocoa nut oil	48	lb.
Fresh tallow	14	lb.
Best Lagos palm oil	1½	lb.

Melt together. To a portion of the fat while still hot add 2 lb powdered and alcoholized orris root, and 2½ lb. powdered and alcoholized bergamot rind, equally distributed. The manipulation is best effected by sifting the perfumes into a large mortar, rubbing continually, and adding more fat until a homogeneous and moderately fluid mass has been formed, which is then added to the mass in the pan.

In the same manner 1½ lb. of liquid storax is dissolved in some pounds of the mixed fat with the aid of heat, and the liquid mass is carefully strained through a cloth into the pan.

The whole mixture of fat is then allowed to cool down to 90° F., and 31 lb. soda lye and 1 lb. potash lye, at 66° Tw., are crutched in the usual manner.

Before putting in the forms the soap is further perfumed with—

Mitcham oil of lavender	250	grn.
Bergamot oil	135	grn.
Sassafras oil	75	grn.
Balsam of Peru	70	grn.
Ceylon oil of cinnamon	10	grn.
Musk	2 to 3	grn.

The musk is ground fine with a little milk sugar, moistened with the oils, and worked into the soap.

The soap when first cut has not a very fine color, and the smell is far from agreeable. In the course of fourteen days it takes a good brown color, and the odor improves with age. —*Chemical Review.*

3. Any white toilet soap strongly scented with essence of orris root, and colored, or not, with tincture of litmus, or a little levigated smalts or indigo. Very fine.

4. White curd soap	3	lb.
Olive oil soap	1	lb.
Palm oil soap	3	lb.

Melted together, and further scented with a little essence of orris root, and colored or not, at will. Very fragrant.

To Prepare a White Soap.—Put into a pan, capable of holding about 100 gal., tallow, lard, or bleached palm oil, 120 lb.; cocoanut oil, 40 lb.; apply gentle heat, with occasional stirring, until all the fatty matter is melted. When the liquid grease has attained the heat of about 126° F., add, gradually, 80 lb. lye at 36° B., and stir well until a complete union of the fatty matters and alkali is effected. The temperature of the ingredients, at the time of adding the alkali, must not be higher than 122° F.; otherwise there will be a separation of the lye from the fatty materials. If the stirring has been diligently pursued, the saponification will be complete in about two hours, and the soap is then ready for the frame. If it is desired to perfume the soap, this should be done while it is in the pan, and before it has had time to cool. It is not a good plan, when making small quantities of soap, to add the perfume after the soap is in the frame, since it is then more difficult to effect a perfect incorporation of the respective materials.

Windsor Soap.—The best Windsor soap is made of a mixture of olive oil, 1 part, and ox tallow or suet, 9 parts, saponified by caustic soda; but most of the Windsor soaps of the shops is merely ordinary curd soap scented. On the large scale the perfume is added while the soap is in the soft state, just before it is put into frames, but on the small scale it may be prepared in the same way as soap à la rose.

1. Best beef tallow and oil soap, as above, 3 cwt.; essence of caraway, 2 lb.; English oil of lavender, ½ lb.; oil of rosemary, ½ lb.; mix as soap à la rose.

2. Hard curd soap, 1 cwt.; oil of caraway, 1½ lb.; tincture of musk, 12 oz.; English oil of lavender, 2 oz.; oil of origanum, ½ oz.; as last.

3. Curd soap, melted and scented with the oils of caraway and bergamot. Brown Windsor soap is the same colored.—*Cooley's Formulas, Old.*

4. This famous toilet soap, as prepared in London, is generally made from tallow, 9 parts, and olive oil, 1 part, and is perfumed (for every 1,000 lb. of the paste) with—

Oil of caraway	6	lb.
Oil of lavender	1½	lb.
Oil of rosemary	1½	lb.

5. Or, for each 100 lb. of soap—

Oil of caraway	5	oz.
Oil of bergamot	10	oz.
Oil of cloves	2½	oz.
Thyme	5	oz.

6. Or, for the same quantity of soap—

Oil of caraway	10	oz.
Oil of bergamot	5	oz.
Oil of lavender	2½	oz.
Oil of rosemary	2½	oz.

Brown Windsor soap is prepared as above, and colored either with burnt sugar (caramel) or umber.

7. Rose Windsor is the plain variety colored with vermilion or iron oxide, and perfumed, after the soap has been transferred to the frame, with essence of roses.

8. Weise's Formula for Windsor Soap.—Tallow, 40 lb., and olive oil, 15 to 20 lb., are saponified with soda lye of 19° B.; the soap next treated with a lye of 15° B., and lastly with a lye of 20° B., and the operation is conducted as for curd soap, but no excess of alkali must be used. When boiled clear, the soap is left in the pan for six or eight hours; it is next completely separated from the lye, and is then placed in a flat mould, and pressed until it no longer exhibits any flux, to prevent it from mottling. To the above proportions the following perfumes are added:

Oil of cumin	10	oz.
Oil of bergamot	6	oz.
Oil of lavender	3	oz.
Oil of origanum	1	oz.
Oil of thyme	3	oz.

Wool Washing, Soap for.—A good soap for freeing wool of grease can best be prepared from olive and Cochin cocoa nut oils. Seventeen hundred and sixty pounds of olive oil are boiled to a grain with caustic soda lye. After the soap has separated and the lye has been drawn off, 1,960 lb. of potash solution of 20° B. are added and allowed to boil a little. Now 440 lb. of Cochin oil are added, and, when well taken up, the same quantity of potash solution of 20° B. is gradually added as the soap can take it up. Then place in tinned forms of about 220 lb. capacity.

A cheap and less valuable article, such as is frequently used for cleaning ordinary wool, is also easy to prepare. Seventeen hundred and sixty pounds of elaine and 440 lb. of tallow are boiled to a grain, the precise method of boiling being immaterial, provided one obtains a good firm grain. In another kettle a soda solution is prepared of 30° B. Now take 220 lb. of this soda solution, place it in a shallow kettle with 440 lb. of the grain soap, stir well and then add, with constant stirring, 220 lb. of dry soda.

In this way a thick paste is obtained, which is allowed to cool in the pan, and is removed after forty-eight hours with a chisel. This is broken up into small pieces of the size of an egg, and packed in barrels for shipment.

A third process, which, however, is but seldom used in soap factories, is the following: Twenty-two pounds of caustic soda lye of 60° B. and 44 lb. of soda crystals are dissolved in 120 lb. of water, and 44 lb. of elaine crutched into the solution. This mixture is adapted to wool washing and is generally prepared by the wool washer himself. The wool, however, becomes dry and brittle after its use.

Almost every establishment has its own approved formula, and every wool washer watches, argus eyed, lest some one discovers his method of making celebrated soap. We can very cheerfully let these people retain their treasure, as a soap boiler would never allow himself to apply the name soap to such a mess. —*Der Seifenfabrikant.*

Wool Washing Compound.—This is a mixture composed of—

Dried soda	35	parts.
Powdered soap	10	parts.
Sal ammoniac	10	parts.

Dimbleby's Witch-hazel Soap.—The juice of the plant *Hamamelis virginica*, or common witch-hazel, is mixed with soap, and the various compounds for toilet purposes which contain soap, and it is said that such compounds are beneficial in cases of bruises and lacerations of the skin.

Yellow Soap.—

Tallow	1½	lb.
Sal soda	1½	lb.
Resin	56	lb.
Stone lime	28	lb.
Palm oil	8	oz.
Soft water	28	gal.

Put soda, lime and water into a kettle and boil, stirring well; then let it settle and pour off the lye. In another kettle melt the tallow, rosin and palm oil, having it hot, the lye being also boiling hot. Mix altogether, stirring well, and the work is done.

Soap Papers, to Wax. See **Waxes.**

Soaps. See also **Polishing.**

Soapstone.—Name frequently applied to steatite.

Soda Cream.—Warm gradually—

Water	4½	gal.
Loaf sugar	15	lb.

Add—

Rich cream	3	qt.
Extract vanilla	2¼	oz.
Extract nutmeg	¾	oz.
Tartaric acid	6	oz.

Bring to a boiling heat. Use 4 or 5 spoonfuls of this syrup to a glass. If used without a fountain, a little soda may be put in the glass. For charged fountains leave out the acid.

Soda Water. See **Waters.**

Soda, Silicate of.—1. Silicate of soda (or soluble glass) is prepared by fusing together carbonate of soda and sand, or by boiling flints in caustic soda under great pressure. It is not soluble in cold water, but dissolves in 5 or 6 times its weight of boiling water. It is employed in the manufacture of soap, in fixing colors, in preserving stones from decay. In admixture with other silicates, silicate of soda occurs in glass; and it (equally with silicate of potassa) imparts the property of viscidity before fusion to such mixtures, which is of great value in the working of glass.

2. Mix well 200 grn. of fine sand and 600 grn. of fine carbonate of potassa; fuse in a crucible capable of holding four times as much. Carbonic acid escapes; the silica and potassa combine and form glass. Pour out the glass, which is commonly termed silicated potassa, on an iron plate. The compound formed in this manner is pure silica soap.

Sodium Amalgam. See **Amalgams.**

Sodium Silicate Cements. See **Cements.**

Solders.—A few solders, the metals to which they are applied, and their appropriate fluxes, are tabulated below:

Name.	Composition.
Soft, coarse	Tin, 1; lead, 2
Soft, fine	Tin, 2; lead, 1
Soft, fusible	Tin, 2; lead, 1; bis., 1
Pewterer's	Tin, 3; lead, 4; bis., 2
Spelter, soft	Copper, 1; zinc, 1
Spelter, hard	Copper, 2; zinc, 1
Silver, fine	Silver, 66·6; copper, 23·4; zinc, 10
Silver, common	Silver, 66·6; copper, 30; zinc, 3·4
Silver, for brass and iron	Silver, 1; brass, 1
Silver, more fusible	Silver, 1; brass, 1; zinc, 1
Gold, for 18 carat gold	Gold, 18 carats fine, 66·6 Silver, 16·7; copper, 16·7
Gold, more fusible	Same as above with a trace of zinc.
Platinum	Fine gold.

Material to be Soldered.	Solder.	Flux.
Tin	Soft, coarse or fine.	Rosin or zinc, chl.
Lead	Soft, coarse.	Rosin.
Brass, copper, iron and zinc	Soft, coarse.	Zinc, chl.
Pewter	Pewterer's or fusible.	Rosin or zinc, chl.
Brass	Spelter, soft.	Borax.
Copper and iron	Spelter, soft or hard.	Borax.
Brass, copper, iron, steel	Any silver, S.	Borax.
Gold	Gold, S.	Borax.
Platinum	Fine gold.	Borax.

Table of Solders.

No.	Name.	Composition.	Flux.	Fluxing point.
1	Plumbers' coarse solder	Tin, 1; lead, 3	R	800° F.
2	Plumbers' sealed solder	Tin, 1; lead, 2	R	441° F.
3	Plumbers' fine solder	Tin, 1; lead, 2	R	370° F.
4	Tinners' solder	Tin, 1½; lead, 1	R or Z	334° F.
5	Tinners' fine solder	Tin, 2; lead, 1	R or Z	340° F.
6	Hard solder for copper, brass, iron.	Copper, 2; zinc, 1	B	....
7	Hard solder for copper, brass, iron.	Good tough brass, 5; zinc 1	B	....
8	Hard solder for copper, brass, iron, more fusible than 6 or 7	Copper, 1; zinc, 1	B	....
9	Hard solder for copper, brass, iron.	Good tough plate brass	B	....
10	Silver solder for jewelers	Silver, 19; copper, 1; brass 1	B	....
11	Silver solder for plating	Silver, 2; brass, 1	B	....
12	Silver solder for silver, brass, iron.	Silver, 1; brass, 1	B	....
13	Silver solder for steel joints	Silver, 19; copper, 1; brass, 1	B	....
14	Silver solder, more fusible	Silver, 5; brass, 5; zinc, 5	B	....
15	Gold solder	Gold, 12; silver, 2; copper, 4	B	....
16	Bismuth solder	Lead, 4; tin, 4; bismuth, 1	R or Z	320° F.
17	Bismuth solder	Lead, 3; tin, 3; bismuth, 1	R or Z	310° F.
18	Bismuth solder	Lead, 2; tin, 2; bismuth, 1	R or Z	292° F.
19	Bismuth solder	Lead, 2; tin, 1; bismuth, 2	R or Z	236° F.
20	Bismuth solder	Lead, 3; tin, 5; bismuth, 3	R or Z	202° F.
21	Pewterers' solder	Lead, 4; tin, 3; bismuth, 2	R or Z	

Abbreviations: R, resin; B, borax; Z, chloride of zinc.

Table of Bismuth Solders.

Tin.	Lead.	Bismuth.	Melts at
4 parts	4 parts	1 part	320° Fahr.
3 parts	3 parts	1 part	310 Fahr.
2 parts	2 parts	1 part	229 Fahr.
1 part	1 part	1 part	254 Fahr.
2 parts	1 part	2 parts	236 Fahr.
3 parts	5 parts	3 parts	202 Fahr.

Brass Solders.

	Copper.	Zinc.	Tin.	Lead.	Color.
Very strong	58	42	....	....	reddish yellow
Strong	53	47	....	....	reddish yellow
Medium	50	50	....	....	reddish yellow
Medium	54½	43½	1½	½	reddish yellow
Easily fusible	34	66	....	....	white
Easily fusible	44	50	4	2	gray
White solder	57	28	15	....	white

Silver Solders.—The following solders are recommended for special work:

		oz.	dwt.	gr.
1.	Fine silver	1	0	0
	Shot copper	0	5	0
	Total	1	5	0
2.	Fine silver	1	0	0
	Shot copper	0	10	0
	Total	1	10	0
3.	Fine silver	0	16	0
	Shot copper	0	0	12
	Composition	0	3	12
	Total	1	0	0
4.	Fine silver	1	0	0
	Composition	0	10	0
	Pure tin	0	2	0
	Total	1	12	0
5.	Fine silver	1	0	0
	Shot copper	0	12	0
	Pure spelter	0	3	0
	Total	1	15	0
6.	Fine silver	1	0	0
	Shot copper	0	3	0
	Arsenic	0	2	0
	Total	1	5	0
7.	Fine silver	1	0	0
	Composition	0	6	0
	Arsenic	0	1	0
	Total	1	7	0
8.	Fine silver	1	0	0
	Composition	0	5	0
	Tin	0	5	0
	Total	1	10	0
9.	Fine silver	1	0	0
	Tin	0	10	0
	Arsenic	0	5	0
	Total	1	15	0
10.	Fine silver	1	0	0
	Composition	0	15	0
	Arsenic	0	1	6
	Total	1	16	6

Solders for Special Purposes.—The best solder for platinum is fine gold. The joint is not only very infusible, but it is not easily acted upon by common agents. For German silver joints, an excellent solder is composed of equal parts of silver brass and zinc. The proper flux is borax.

Solders.	Gold.	Silver.	Copper.	Tin.	Zinc.	Lead.	Bismuth.	Brass.	Melting point.
Pewterer's	..	..	..	2	..	1	2	..	360°
Pewterer's, soft	..	..	..	3	..	4	1	..	....
Pewterer's, soft	..	..	..	2	..	1	..	..	.....
Tinman's	..	..	..	1	..	1	..	..	393
Coarse	..	..	..	1	..	3	..	..	500
Plumber's	..	..	..	1	..	2	..	..	475
Hard spelter	..	..	4	..	3	..	..	..	1,869
Gold	6	1	2	..	..	..	..	..	.....
For brazing steel	..	19	1	..	..	..	..	2	.....
Hardest silver	..	4	1	..	..	..	..	..	.....
Hard silver	..	3	..	..	..	..	1	..	.....
Soft silver	..	2	..	..	..	..	1	..	.....
For aluminum	..	2	..	2	1	2	..	..	.....

White Solders for Gold Work.

No.	Name.	Fine Silver.	Copper.	Spelter.	Fusing Point.
1	Hard solder	16 parts	3½ parts	½ part	1,866° F.
2	Medium	15 parts	4 parts	1 part	1,843° F.
3	Easy	14 parts	4½ parts	1½ part	1,818° F.
4	Common hard	12½ parts	6 parts	1½ part	1,826° F.
5	Common easy	11½ parts	6½ parts	2 parts	1,802° F.

Colored Solders for Gold Work.

No.	Name.	Fine Gold.	Fine Silver.	Shot Copper.
1	Best gold solder	12½ parts	4½ parts	3 parts.
2	Medium gold solder	10 parts	6 parts	4 parts.
3	Common gold solder	8½ parts	6½ parts	5 parts.

Silver Solders.

No.	Name.	Fine Silver. oz.	dwt.	grn.	Shot Copp'r oz.	dwt.	grn.	Brass. oz.	dwt.	grn.	Zinc. oz.	dwt.	grn.	Tin. dwt.	Arsenic. dwt.	Compo. dwt.	grn.
1	Hardest Silver Solder	1	0	0	0	5	0	..	..	..	..	..	..	..	..	..	..
2	Hard	1	0	0	..	..	..	0	6	16	..	..	..	..	..	..	..
3	Easy	1	0	0	..	..	..	0	10	0	..	..	..	..	..	..	..
4	Best hard	1	0	0	0	4	9	..	..	..	0	0	15	..	..	..	..
5	Medium	1	0	0	0	5	8	..	..	..	0	1	8	..	..	..	..
6	Easy	1	0	0	0	6	12	..	..	..	0	2	4	..	..	..	..
7	Common	1	0	0	0	9	15	..	..	..	0	2	9	..	..	..	..
8	Enameling	1	0	0	0	5	0	..	..	..	..	..	..	..	..	..	..
9	Enameling	1	0	0	0	10	0	..	..	..	..	..	..	..	..	..	..
10	Filigree	0	16	0	0	0	12	..	..	..	..	..	..	..	..	3	12
11	Quick running	1	0	0	..	..	..	..	..	..	..	..	..	..	2 0	10	0
12	Chain	1	0	0	0	10	0	..	..	..	0	2	0	..	..	..	..
13	Easy chain	1	0	0	..	..	..	..	..	..	0	2	0	..	..	10	0
14	Common	1	0	0	0	12	0	..	..	..	0	3	0	..	..	..	..
15	Common easy	1	0	0	..	..	..	..	..	..	0	3	0	..	..	12	0
16	Very common	1	0	0	..	..	..	..	..	..	..	..	..	..	1 oz.	1	oz.

Soldering.—To solder seams properly, the old solder should be melted off, the old tin nicely retinned, and strips of tin soldered over the old seam. The edges of the strips can be bent slightly in the locker, so they will not spring up while being soldered.

For Sealing Iron in Stone.—

Lead	2	parts.
Zinc	1	part.

For Sealing Tops of Canned Goods.—

Lead	1¼	lb.
Tin	2	lb.
Bismuth	2	oz.

The lead is melted first, the tin added next, and finally the bismuth stirred in well just before pouring. This makes a soft solder and the cans do not take much heat to open them.

Soldering Liquid.—1. This liquid, which causes no rust on iron or steel, is prepared by cutting zinc into small pieces, dissolving in hydrochloric acid until the acid ceases to bubble. Add about ¼ part of the solution of ammonia, which neutralizes the acid. Dilute the whole quantity of liquid with an equal quantity of water.

2. Dissolve in 12 parts of water 1½ parts glycerine and 1½ parts lactic acid. This liquid is not corrosive or injurious to workmen

Soldering Paste.—A soldering paste is obtained by mixing starch paste with a solution of chloride of tin. This produces a liquid about the consistency of syrup, which is more readily applied to the soldering seam than ordinary soldering liquid. Used for soft soldering.

A Useful Kind of Solder.—A soft alloy which attaches itself so firmly to the surface of metals, glass and porcelain, that it can be employed to solder articles that will not bear a very high temperature, can be made as follows:

Copper dust obtained by precipitation from a solution of the sulphate by means of zinc is put in a cast iron or porcelain lined mortar and mixed with strong sulphuric acid, specific gravity 1·85. From 20 to 30 or 36 parts of the copper are taken, according to the hardness desired. To the cake formed of acid and copper there is added, under constant stirring, 70 parts of mercury. When well mixed the amalgam is carefully rinsed with warm water to remove all the acid, and then set aside to cool. In ten or twelve hours it is hard enough to scratch tin. If it is to be used now, it must be heated so hot that when worked over and brayed in an iron mortar it becomes as soft as wax. In this ductile form it can be spread out on any surface, to which it adheres with great tenacity when it gets cold and hard.—*Polyt. Notizblatt.*

Soldering Aluminum.—The following alloys are given:

1. Aluminum	8	parts.
Zinc	92	parts.
2. Aluminum	12	parts.
Zinc	88	parts.

3. Aluminum .....15 parts.
Zinc.....85 parts.
4. Aluminum .....20 parts.
Zinc.....80 parts.

The aluminum is first melted, the zinc added gradually, finally some fat is added, and the whole is stirred with an iron rod and poured into moulds. For flux use copaiba balsam, 3 parts; Venice turpentine, 1 part, and a few drops of lemon juice. Dip the soldering iron into the same flux.

Argentum Solder, Readily Fusible.—

Copper.....17½ parts.
Zinc.....28½ parts.
Nickel.....4 parts.

Black Solder.—

1. Copper.....2 lb.
Zinc.....3 lb.
Tin.....2 oz.
2. Sheet brass.....20 lb.
Tin.....6 lb.
Zinc.....1 lb.

Brass or Copper, Yellow Solder for.—

1. Copper.....1 lb.
Zinc.....1 lb.

2. Stronger—Copper, 32 lb.; zinc, 29 lb.; tin, 1 lb.

3. Zinc, 2 parts, with borax; copper, 6 parts.

4. For soldering brass to platinum, put a piece of thick brass wire in a handle, and flatten and file the end like the point of a soldering bit; dip this end in soldering fluid, and, holding it in the flame of gas or lamp, run a little solder on it; now, having put some fluid on the platinum, which will require to be supported with a fine pair of tongs, place it near the flame, but not in it, at the same time heating the brass wire in the flame with the other hand, and as soon as the solder melts it will run on to the platinum; you must put very little on, and take care the solder does not run to the other side. Having applied soldering fluid or rosin to the brass, hold the two together in any convenient manner, and warm them in the flame till the solder runs. It is best to use rosin for electrical work, unless the work can be separated and thoroughly cleaned.

5. Soldering Brass.—All kinds of brass may be soldered with Bath metal solder (79 copper, 21 zinc) or soft spelter, using borax as a flux. A good plan is to spread on a little paste of borax and water and lay a bit of tinfoil on this, then heating till the tin melts and runs, and thus coats the surface. Work previously tinned in this way can be joined neatly and easily.

Brass, to Solder Sheet.—For soldering with a copper, use a solder made of 2 parts tin, 1 part lead, by weight; melt, mix, and pour in small bars. For flux dissolve zinc in muriatic acid until no more will dissolve, add about one tenth its bulk of sal ammoniac, and dilute with quarter its bulk of water. Wet the surfaces to be soldered with this solution, using a piece of wood or copper wire for this purpose. Then, by rubbing the surfaces with the tinned point of the copper, a coating of tin will be imparted. Put both surfaces thus prepared together, and heat by applying the copper and a little solder to the outside of the seam. The copper should be well tinned on the point, which may be done by heating the copper hot enough to freely melt pure tin. Rub a piece of sal ammoniac on a brick, then rub the copper point on the brick, with tin or solder in contact with the point. The tinning of the copper point is essential for soldering.

White Solder for Raised Britannia Ware.—Tin, 50 lb.; copper, 4 lb.; tin, 2 lb.; antimony, 4 lb.

Cold or Chemical S.—A neat mode of soldering for small articles: Cut a piece of tin foil the size of the surfaces to be soldered; dip a feather in a solution of sal ammoniac, and paint over the surfaces of the metal; then place them in their proper position, with the tin foil between; put it so arranged on a piece of iron hot enough to melt the foil; when cold they will be found firmly fastened together.

For soldering without the use of an iron, the parts to be joined are made to fit accurately, either by filing or on a lathe. The surfaces are moistened with soldering fluid, a smooth piece of tinfoil is laid on, and the pieces are pressed together and tightly wired. The article is then heated over the fire by means of a lamp until the tinfoil melts. In this way two pieces of brass can be soldered together so nicely that the joint can scarcely be found.

Fluxes.—1. Muriatic acid with zinc dissolved in it till it will take no more.

2. Dissolve zinc in hydrochloric acid until the acid will dissolve no more; dilute with water.

Cold Soldering.—Various nostrums have been proposed from time to time which profess to be reliable methods of soldering without heat; but when tried, they have generally proved useless. The following recipe, which is due to Fletcher, of Warrington, will be found to be more truthworthy. It must be borne in mind that, though the first preparation is tedious, a large quantity of the materials can be made at once, and the actual soldering process is as simple and quick as it well can be.

Flux: One part metallic sodium to 50 or 60 parts of mercury. These combine on being well shaken in a bottle. If this is too much trouble, the sodium amalgam can be bought, ready made, from any chemist or dealer in reagents. This sodium amalgam must be kept in a stoppered bottle closed from the air. It has the property of amalgamating (equivalent to tinning by heat) any metallic surface, cast iron included.

Solder.—Make a weak solution of copper sulphate, about 1 oz. to 1 qt. of water. Precipitate the copper by rods of zinc; wash the precipitate two or three times with hot water; drain the water off, and add, for every 3 oz. of precipitate, 6 or 7 oz. mercury; add also a little sulphuric acid to assist the combination from the two metals. When combined, they form a paste which sets intensely hard in a few hours, and this paste should be made, while soft, into small pellets.

When wanted for use, heat one or more of the pellets until the mercury oozes out from the surface in small beads; shake or wipe them off, and rub the pellet into a soft paste with a small mortar and pestle, or by any other convenient means, until it is as smooth and soft as painter's white lead. This, when put on a surface previously amalgamated by the sodium and mercury, adheres firmly, and sets perfectly hard in about three hours. The joint can be parted, if necessary, either by a hammer and cold chisel or by a heat about sufficient to melt plumbers' solder.—*Mechanics' Own Book.*

Copper, Solder for.—Copper, 10 lb.; zinc, 9 lb.

Soldering Liquid for Copper and Bronze (Gauduin's).—This liquid is prepared by mixing finely pulverized cryolite and a solution of phosphoric acid, in spirits of wine.

Solder for Copper, Iron, and Dark Brass.—Copper and zinc, equal parts melted together. For pale brass use more zinc.

Solder for Copper.—Copper, 10 lb.; zinc, 9 lb.

Solder for Copper.—Melt together and thoroughly mix—

Brass.....9 parts.
Zinc.....1½ parts.
Tin.....1½ parts.

Coppersmith's Solder.—

Lead.....2½ parts.
Tin.....5 parts.

If the copper is thick, heat by a naked fire; if thin, use a tinned copper tool. The flux is muriate or chloride of zinc, or resin. This solder will also do for iron, cast iron or steel.

Enamel Solder.—

Copper	25 parts.
Silver	7·07 parts.
Gold	67·93 parts.

Very Refractory Solders for Articles to be Enameled.—

Silver	18 parts.
Gold	74 parts.

Soldering Fat.—

Olive oil	1½ lb.
Tallow	1½ lb.
Colophony (pulverized)	12 oz.

Melt these ingredients and let them boil up. When this mixture has become cool add ⅜ pt. of water, saturated with pulverized sal ammoniac, stirring constantly. This gives the mass a yellow color. Used for soft soldering.

Soldering of Glass and Porcelain with Metals.—Mr. Cailletet has recently made known to the *Societe de Physique* a process of soldering glass and porcelain with metals. Mechanists, physicists and chemists will appreciate the practical importance of this process, which permits of adapting any metallic object whatever (cock, tube, conducting wire, etc.) to experimental apparatus in such a way as to prevent any leakage, even under high pressures.

The process is very simple. The portion of the tube that is to be soldered is first covered with a thin layer of platinum. This deposit is obtained by covering the slightly heated glass, by means of a brush, with very neutral chloride of platinum, mixed with essential oil of chamomile. The oil is slowly evaporated, and, when the white and odoriferous vapors cease to be given off, the temperature is raised to a red heat. The platinum is then reduced and covers the glass tube with a bright layer of metal. On fixing the tube thus metalized, and placed in a bath of sulphate of copper, to the negative pole of a battery of suitable energy, there is deposited upon the platinum a ring of copper, which should be malleable and very adhesive if the operation has been properly performed.

In this state, the glass tube covered with copper can be treated like a genuine metallic tube and be soldered by means of tin to iron, copper, bronze, platinum, and all metals that can be united with tin solder.

The resistance and strength of such soldering are very great. Mr. Cailletet has found that a tube of his apparatus for liquefying gases, the upper extremity of which had been closed by means of an adjutage thus soldered, resists pressures of more than 300 atmospheres. The tube, instead of being platinized, may be silverized by raising the glass covered with nitrate of silver up to a heat bordering on red. The silver thus reduced adheres perfectly to the glass, but numerous experiments have caused platinizing to be preferred to silverizing in the majority of cases.—*La Nature.*

Glaziers' Solder.—Lead, 5 parts; tin, 1⅜ part. This melts at 500° F.

Gold Solder.—Copper, 24·24 parts; silver, 27·57 parts; gold, 48·19 parts.

Hard Soldering.—Joints and catches may be fixed on brooches, of whatever kind they may be, either by soft or hard solder. In the case of coin jewelry, hard solder is best. This may be procured in small quantities of any obliging jeweler; ten cents worth will do twenty jobs. If not so procurable, get a small piece of good silver and melt it up with about twice its weight of good brass wire; then hammer it out thin, and use as required. In melting the solder use borax as a flux. Get a piece of pumice stone, and rub one side flat, taking care that the surface is clean; then fix the joint and catch in their respective positions on the coin, having previously applied a little moist borax to the surfaces in contact, and bind them over with fine iron wire, taking care in so doing that the wire does not touch the parts where the solder is required to flow. Molten solder exhibits this peculiarity—that, in whatever part the greatest heat is applied, it flows to that point, so that if the heat is misapplied the solder flows anywhere but in the desired place. Having bound the coin with wire on the flat side of the pumice stone, to prevent it slipping off, apply the little pieces of solder to the joint and catch, and with the gas and blowpipe steadily raise the heat until the solder is seen to flow. Stop blowing at once then, and examine to see if the connection is perfectly made. If not, apply a little more borax and solder, and repeat the operation of heating. The flame, which should not be larger than the top of a small wineglass, should be directed just a little behind the joint or catch, the solder being put the other side, and so be drawn under when it melts. When the parts are properly soldered on, remove all traces of wire, and immerse in the vitriol solution composed of sulphuric acid diluted with water (1 to 3 or 4). Allow it to remain therein for an hour or two, when it must be taken out and swilled in clear water. It should come out a pure dead white. If it is desired that this white bloom be preserved, do not brush it in any way—simply wipe dry, or dry in hot sawdust. If you require it to be bright, brush it with rouge or any polishing material, and rub up with chamois leather. To remove rivets from brooch joints, the burr, or rivet head should be filed off, and the pin pushed out either with a steel point or be removed with the nippers by putting the point of one jaw on the broken pin, and the other on the end of the rivet, and so force it a little way out, and then take hold of the protruding end with both jaws and pull out. Another way is to put an old watch key in the vise, place the joint over it—*i. e.*, resting upon it—and drive the rivet out with hammer and pin push. The holes of brooch joints and pins may readily be opened with suitable broaches, which are long, slender tools with four or five cutting edges upon them, and to be bought for about ten cents at any trade tool shop. They are sometimes called rimers. To produce a good and tapered point to a pin, you will need a pin vise and filing block, together with rough and fine files and a burnisher. Take the pin vise in the left hand, having previously fixed the pin firmly in the center of the jaws, and with the file in the right, and a shallow rut cut in the filing block, proceed to file and twirl the pin vise with a rapid, steady motion, always observing to keep the pin going in the opposite way to the thrust of the file. Bear in mind what you desire to obtain, and work to that end, always bearing on the file more to the side of the point. When roughly shaped, finish off with a fine file, or Ayr stone, and burnish. In cutting the pin joint to fit, be sure to make it square with the brooch joint. Let the hole in the pin joint be a shade larger than the others; then, if the rivet is properly filed up, it may be forced in sufficiently tight to hold secure with little or no riveting over. The pin point should protrude about ¼ in. beyond the catch.—*English Mechanic.*

Solder for Iron and Brass.—If the metals are not to be subjected to extreme heat after they are soldered together, the following method will prove successful if carried out as explained below: First make the iron clean and bright; then afterward tin it by means of a little tin solder and a small portion of clean rosin as a flux. This proceeding will require some degree of patience and time before it will be properly accomplished. The iron should be kept as warm as possible during the process of tinning. When this is done, clean the piece of brass as bright and free from any dirt as possible; then afterward tin it over with the same solder, using rosin as a flux. Now, if convenient, place the two pieces of metal to be united in a vise; place a small portion of solder between with a little rosin. Use the blowpipe. As the solder gets gradually hotter between the two

pieces of metal the vise should be drawn tighter, so as to insure a close joint. When set the joint will be firm and strong. I once fastened a piece of brass to a piece of cast iron in this way and found it both strong and durable. If this method fails, it is only because it has not been properly done.—*Correspondent in Eng. Mech.*

Jewelers' Soldering Fluid.—Add to alcohol as much chloride of zinc as it will dissolve. A good soft solder for repairing is prepared from equal quantities of tin and lead from tea boxes.

Laying Sheet Lead.—In laying sheet lead for a flat roof, the joints between the sheets are made either by rolls, overlaps or soldering. In joining by rolls, a long strip of wood two inches square, flat at the base and rounding above, is placed at each seam; the edge of one sheet is folded round the rod and beaten down close, and then the corresponding edge of the next sheet is folded over the other. In overlapping, the adjacent edges of the two sheets are turned up side by side, folded over each other and closely beaten down. Soldering is not adopted when the other plans can be carried out.

Lute for Soldering.—A lute for the joints of iron vessels may be composed of 60 parts of finely sifted iron filings and 2 parts of sal ammoniac in fine powder, well mixed with 1 part of flowers of sulphur. This powder is made into a paste with water and immediately applied; in a few seconds it becomes hot, swells, disengages ammonia and hydric sulphide, and soon sets as hard as the iron itself.

Solder, Magic, as Sold by Peddlers.—Melt together in a crucible at a very moderate heat, bismuth, 1 part; tin, 3 parts; lead, 2 parts, and cast in slender sticks.

Pewter and Britannia Metal.—1. Ten parts tin, 5 parts lead, bismuth, 1 to 3 parts.

2. Take 3 parts tin; lead, 1½ parts; bismuth, 1½ parts.

3. Solder for Tin or Pewter.—Tin, 2 parts; lead, 1 part; bismuth, 1 part.

4. Soldering Pewters and Compo. Pipes.—These require powdered rosin as a flux, with very thin strips of the more fusible solders, care being taken that the soldering iron is not too hot.

Soldering Platinum and Gold.- To make platinum adhere firmly to gold by soldering, it is necessary that a small quantity of fine or 18 carat gold shall be sweated into the surface of the platinum at nearly a white heat, so that the gold shall soak into the face of the platinum; ordinary solder will then adhere firmly to the face obtained in this manner. Hard solder acts by partially fusing and combining with the surfaces to be joined, and platinum alone will not fuse or combine with any solder at a temperature anything like the fusing point of ordinary gold solder.

Silver Solder for Plated Metal.—Melt together 10 dwts. of brass and 1 oz. pure silver.

German Silver, to Solder.—To solder German silver, pour out some spirit of salt in an earthenware dish, and add a piece of zinc. Then scrape clean the edges to be soldered, and paint over with the spirit of salt. Apply a piece of pewter solder to the point and melt with the blowpipe.

Silver, Anti-oxidizer for.—A wash of a paste of whiting and water dried on the bright parts of jewelry or silverware will save it from oxidation while soldering, but must not interfere with the boraxed joint to be soldered.

Soft Soldering.—The solder is an alloy of 2 parts of tin to 1 part of lead, fusible at 340°; or, for cheapness, the proportion is sometimes 3 to 2, fusible at 334°. This substance is applied with a hot copper bolt, or blowpipe flame. Heat, however, would soon cause the edges of the metal again to oxidize; therefore, the edges are covered with a substance having a strong attraction for oxygen, and disposing the metal to unite to the solder at a low temperature. Such substances are called fluxes, and are chiefly borax, resin, sal ammoniac, chloride of zinc, Venice turpentine, tallow or oil.

Hard Soldering Steel.—Solder will not run on iron quite so well as on silver or brass. See that the steel is clean and bright, use the borax as a thick paste, and the operation must be concluded quickly.

Solder for Steel Joints.—

Brass	3 parts.
Copper	1½ part.
Silver	28½ parts.

To Remove Tarnish from Gold after Hard Polishing.—Paint the gold over before soldering with a mixture of yellow ocher, ground up with water and a small quantity of borax. After soldering throw it into a pickle of water, 9 parts, and sulphuric acid, 1½ part. If the gold is whitish looking and shows the silver alloy after being removed from this pickle, dip a moment in a hot solution of sulphuric acid and saltpeter. Wash, polish first with rottenstone and oil; then after washing, again polish with rouge.

Steel Wire, to Solder.—Mix 1 lb. lactic acid, 1 lb. glycerine and 8 lb. water, so as to have a clear solution. This is non-corrosive, but does not work as quickly as the ordinary soldering acid.

Solder Wire.—Melt together equal parts of tin and lead and pour it through a vessel having a very small opening into a tub of water.

Zinc and Galvanized Iron, Soldering.—Zinc may be soldered as readily as tin by using dilute hydrochloric acid (⅛ its bulk of rain water added) as a flux instead of rosin, and by taking care to keep the soldering iron well heated.

Soluble Glass. See **Glass,** and also **Sodium Silicate.**

Solution.—Any menstruum having dissolved in it sufficient of any soluble substance to impart to the liquid its peculiar properties is a solution. The term solution, therefore, is applicable to almost the entire range of liquids, but is usually restricted, unless otherwise designated, as alcoholic or acetic solution, etc., to those in which water is the menstruum. Alcohol comes after water, then ether, in their power of dissolving substances. The temperature and the degree of fineness of the substance all affect the time which is required to make a solution. Warm water will dissolve most substances much faster than cold water.

Solvent.—A solvent or menstruum is a liquid in which any substance is dissolved.

Solvent, Glazier's.—1. Dissolve soft soap in 3 times its weight of strong lye.

2. Make a thin paste or cream with freshly slaked lime and twice its weight of pearlash and a little water.

Sorel's Alloy. See **Alloys.**

Sorel's Cement. See **Cements**—*Sorel.*

Soy.—Genuine soy is a species of thick black sauce, imported from China, prepared with white haricots, wheat flour, salt and water; but a spurious kind is made in England as follows: Seeds of dolichos soja (peas or kidney beans may be used for them), 1 gal.; boil till soft; add bruised wheat, 1 gal.; keep in a warm place 24 hours; then add common salt, 1 gal.; water, 2 gal.; put the whole into a stone jar, bung it up for two or there months, shaking it very frequently; then press out the liquor; the residuum may be treated afresh with water and salt, for soy of an inferior quality.

Sozodont. See the **Teeth.**

Specific Gravity. See **Gravity, Specific,** and also the **Appendix.**

Specimens, to Preserve. See **Anatomical Preparations.**

Speculum Metal. See **Alloys.**

Speise. See **Regulus.**

Spence's Metal. See **Alloys.**

Spermaceti.—A concretion prepared from the oily matter of the head of the spermaceti whale.

Sperm Oil. See **Oils.**

Spirits of Wine. See **Alcohol.**

Sponges, to Bleach. See **Bleaching.**

Spots and Stains, to Clean. See **Cleansing.** *(Spots and Stains.)*

Springs, to Temper. See **Tempering.**

Sprinkle Green, for Books.—1. Yellow the edge; then sprinkle with dark blue.

2. French berries, 1 part; soft water, 8 parts. Boil, and add a little powdered alum; then bring it to the required shade of green, by adding liquid blue.

Purple—For Bookbinders.—1. Logwood chips, 4 parts; powdered alum, 1 part; soft water, 24 parts; boil until reduced to 16 parts, and bottle for use.

2. Brazil dust (fine), and mix it with potash water for use.

Red—For Binders.—Brazil wood (ground), 4 parts; alum, 1 part; vinegar, 4 parts; water, 4 parts. Boil until reduced to seven parts; then add a small quantity of loaf sugar and gum. Bottle for use.

Spruce Beer. See **Beer, Spruce.**

Squibs. See **Pyrotechny.**

Staining. See also **Dyeing.**

Alabaster, to Stain or Color.—1. Mix various colored powders or solutions with the plaster, at the time of mixing it up with water. A little terra de Sienna, in very fine powder, or ground with water, added to the water employed to mix up the plaster, imparts a pleasing color to busts, statues, medallions, etc.

2. Objects formed from the solid alabaster may be stained in the same way, and with the same materials as marble. See *Marble.*

Bricks, to Stain.—1. For staining bricks red, melt 1 oz. of glue in 1 gal. of water; add a piece of alum the size of an egg, then ½ lb. Venetian red and 1 lb. of Spanish brown. Try the color on the bricks before using, and change light or dark with the red or brown, using a yellow minerai for buff.

2. For coloring black, heat asphaltum to a fluid state, and moderately heat the snrface of the bricks and dip them.

3. Or make a hot mixture of linseed oil and asphalt; heat the bricks and dip them. Tar and asphalt are also used for the same purpose. It is important that the bricks be sufficiently hot, and be held in the mixture to absorb the color to the depth of ⅛ of an inch.

4. Red Wash for Bricks.—Melt ½ oz. of glue in 2 qt. water. While hot put in a piece of alum about half as large as an egg, ¼ lb. Venetian red, and ½ lb. Spanish brown. Try a little on the bricks, let it dry; if the color is too light, add more red and brown; if too dark, add more water.

Glass, to Stain.—Glass staining may be done at home by the following process: Spread over the glass a strong gum water, and when dry lay it over the paper on which the design is sketched, and trace with a fine hair pencil all the outlines. Dip the tube-like pencils in the colors, and let them flow out upon the glass; have a care, and not touch the pencil to the glass. The lights and shades are produced in a variety of ways; one of the easiest, and especially to beginners, is to take a goose quill cut in the shape of a pen, without the slit, and with it carefully take out the lights by lines and little dots. This part of glass staining is the most exacting and difficult, as much of the effect depends upon the shading. The glass is then ready for the kiln.

Horn, to Stain.—1. After having fine sandpapered the horns, dissolve 50 to 60 gr. nitrate of silver in 1 oz. distilled water. It will be colorless. Dip a small brush in, and paint the horns where they are to be black. When dry, put them where the sun can shine on them, and you will find that they will turn jet black. When done, polish off.

2. By boiling well in infusions of various colored ingredients, and is done to imitate tortoise shell. Mix together pearlash, quicklime, and litharge, with a sufficient quantity of water, and a little pounded dragon's blood, and boil them togeher for ½ hour; apply this hot; for black—iron, iron filings, copperas, with vinegar applied on this.

3. Black.—Burned lime 5·5 lb. are slaked in a little water, so that a powder-like hydrate of lime is obtained; this is mixed with 2·2 lb. minium, and this mixture is formed into a thick paste with such lye as soap boilers use, having a specific weight of 1·036. The articles of horn are placed in this solution for 24 hours; they are then taken out, rinsed off with water, dried with a cloth, brushed over with rape-seed oil, and then again rubbed dry.

4. Black.—Dissolve 0·14 oz. silver in 2·1 oz. nitric acid (aquafortis), and this solution is applied several times to the article to be stained, but it is absolutely necessary that the first coat should be entirely dry before another is applied. The articles are then burnished and made bright.

Blue.—Stain green, and then steep for a short time in a weak solution of sulphate of indigo, containing a little cream of tartar.

Brown.— Immerse in aqueous solution of potassium ferrocyanide, dry, and treat with a hot dilute solution of copper sulphate.

Green.—1. Dissolve 0·52 oz. fine indigo carmine in 2·1 oz. rain water. Then 0·175 oz. pure picric acid are dissolved in 2·1 oz. boiling hot rain water, and both solutions are mixed together. A very beautiful, durable green color will in this manner be obtained, and can be used for the various manipulations.

2. Aniline green, 0·35. Dissolve in 4·2 oz. 90% alcohol, and the horn to be stained is treated with this solution. All the different shades of green may be produced by adding blue or yellow stain.

3. Copper, 4·2 oz. Cut up finely and gradually dissolved in 13 oz. nitric acid (aquafortis), and the articles to be stained are boiled in this solution until they have assumed a fine green color.

4. Steep in a solutiou of 2 parts of verdigris and 1 part of sal ammoniac.

Purple.—1. Logwood, 17·5 oz., are boiled in 4·4 lb. milk of lime, and the same method is observed as given in red.

2. Use a strong aqueous solution of gold chloride.

Red.—1. Red Brazil wood, 17·5 oz., are boiled for one hour in 4·4 lb. milk of lime and filtered through a cloth. The articles of horn, ivory or bone to be stained are boiled for one hour in a solution of 1·05 oz. alum in 17·5 oz. water. They are then placed in the above stain, and allowed to remain there until the desired color has been produced. Articles stained in this manner will acquire a beautiful purple color by dipping them in alum water.

2. Soak in very dilute nitric acid for a few minutes and apply a strong infusion of cochineal in aqua ammonia.

3. Bright Red.—Logwood, 8·75 oz., and 8·75 oz. red Brazil wood are boiled in 4·4 lb. milk of lime. It is applied in the same manner as 1.

4. Tortoise Shell.—A rough dough is prepared from 17·5 oz. white litharge, 2·2 lb. finely powdered unslaked lime, 3·3 lb. soap boilers' lye having a specific weight of 1·036. The places of the horn which are to become dark are covered with this dough, and the horn is allowed to remain in contact with the dough for about twenty-four hours, until the latter has become entirely dry. The horn is then cleansed with a brush.

5. Yellow.—Alum, 17·5 oz., free from iron, are dissolved in 4·4 lb. rain water. The articles are allowed to lie in this for one or two hours. In the meanwhile 7 oz. yellow berries are boiled with 4·2 oz. carbonate of potash in 2·2 lb. water for one hour, and then strained. The articles stained with alum are placed in this decoction and allowed to lie in it for one hour. They are then taken out and dried.

6. Steep them in a solution of lead acetate and then, after drying, in a solution of bichromate of potash.

Ivory, to Stain. See also **Dyeing.**—For Black.—Boil for a short time in a strained solution of logwood; afterward immerse in a solution of iron sulphate.

Blue.—Immerse for a short time in a dilute solution of indigo carmine.

Yellow.—Immerse for about fifteen minutes in a solution of potassium chromate.

Red.—Macerate cochineal in vinegar, and boil in the liquid for a few minutes.

Violet.—Dye red first, then immerse for an instant in solution of indigo carmine.

Green.—Dye yellow first, and afterward dip into solution of indigo carmine.

To Stain Ivory Black.—The pieces are always first polished with whiting and water, and when washed quite clean from the whiting, are then prepared for the stain by a short immersion of from three to five minutes in acidulated cold water, in proportion of one part of muriatic acid, the ordinary acid of commerce, to 40 or 50 parts of water, or in an equally weak solution of nitric acid. This cleansing fluid extracts the gelatine from the surface of the ivory, and is essential to the attainment of a perfectly uniform color. Extreme cleanliness and the absence of any grease or accidental soiling are as necessary, with which view the work in process of staining is at no time touched by the fingers, but is removed from one vessel to another by flat pieces of wood, attached to each other at one end by a flat metal spring, after the form of a pair of sugar tongs, separate pairs being kept for different colors. Subsequently to its treatment with the acid, the ivory is invariably again placed in cold water that has been boiled, before it is transferred to the stain. Logwood stain is: Make a decoction of 2 oz. of logwood dust in 1 qt. of water, and strain; dissolve 1 oz. of sulphate of iron in 1 qt. of water; then heat the two stains in separate vessels to 100° F., and immerse the ivory in the logwood stain for fifteen minutes; well wash, and then place it for five minutes in the sulphate of iron stain. —*Holtzapffel, Vol. II.—Thomas Stow.*

Leather, to Stain.—To stain a sole leather bag somewhat abraded a dark mahogany color.—

Alkanet root	15	grn.
Aloes	30	grn.
Dragon's blood (all in powder)	30	grn.
95% alcohol	500	grn.

Moisten the bag with dilute nitric acid (1 part acid to 5 parts water by volume) and then apply above solution. Repeat until dark enough.

Marble, Blue Stain for.—Tincture or solution of litmus, or an alkaline solution of indigo. Heat the marble so that the liquid will just simmer on the surface.

Pottery, Stains for.—In preparing these stains the ingredients must be ground remarkably fine, and then so perfectly dried as not to leave the least humidity, after which they must be ground again with oil prepared for the purpose, composed of 2 parts of balsam of sulphur, 1 part of amber oil, and as much turpentine as will render them of a proper consistency; they may then be used with ease for painting various devices on biscuit ware.

Blue Stain.—Five parts blue calx, 2 parts frit for glazes, without oxide of tin, 1 part flint glass, 1 part enamel blue.

Yellow Stain.—Three parts yellow under glaze, 1 part frit for glazes, ¼ part chromate of iron.

Green Stain.—Three parts blue stain, 1 part yellow stain, ½ part enamel blue green.

Wood Staining.—The best woods for staining are those of close, even texture, as cherry, beech, birch and maple. The wood should be perfectly dry, and planed and sandpapered very smooth. Nearly all of the stains should be applied hot, as this causes them to penetrate the pores more deeply. If the wood is to be varnished many of the dyes used in cloth dyeing may be used in alcoholic solutions, but the effect is not equal to the regular stain. In case the natural color of the wood prevents the wood being stained satisfactorily, bleach the wood by saturating with the following solution:

Chloride of lime	9	oz.
Soda crystals	1	oz.
Water	2½	qt.

The wood may be bleached in this for ½ hour. Wash with a solution of sulphurous acid, then with water.

Wood to Stain.—Black.—1. Obtained by boiling together blue Brazil wood, powdered gall apples and alum, in rain or river water until it becomes black. This liquid is then filtered through a fine organzine, and the objects painted with a new brush before the decoction has cooled, and this repeated until the wood appears of a fine black color. It is then coated with the following liquid: A mixture of iron filings, vitriol and vinegar is heated (without boiling), and left a few days to settle. Even if the wood is black enough, yet for the sake of durability, it must be coated with a solution of alum and nitric acid, mixed with a little verdigris; then a decoction of gall apples and logwood dyes is used to give it a deep black. A decoction may be made of brown Brazil wood with alum in rain water, without gall apples; the wood is left standing in it for some days in a moderately warm place, and to it merely iron filings in strong vinegar are added, and both are boiled with the wood over a gentle fire. For this purpose soft pear wood is chosen, which is preferable to all others for black staining.

2. One ounce nut gall broken into small pieces, put into barely ½ pt. vinegar, which must be contained in an open vessel; let stand for about ½ hour; add 1 oz. steel filings; the vinegar will then commence effervescing; cover up, but not sufficient to exclude all air. The solution must then stand for about 2½ hours, when it will be ready for use. Apply the solution with a brush or piece of rag to the article, then let it remain until dry; if not black enough, coat it until it is—each time, of course, letting it remain sufficiently long to dry thoroughly. After the solution is made, keep it in a closely corked bottle.

3. One gallon water, 1 lb. logwood chips, ½ lb. black copperas, ½ lb. extract of logwood, ½ lb. indigo blue, 2 oz. lampblack. Put these into an iron pot and boil them over a slow fire. When the mixture is cool, strain it through a cloth, add ¼ oz. nut gall. It is then ready for use. This is a good black for all kinds of cheap work.

4. Campeachy wood, 250 parts; water, 2,000 parts; and copper sulphate, 30 parts; the wood is allowed to stand 24 hours in this liquor, dried in the air, and finally immersed in iron nitrate liquor at 4° B.

5. Boil 8¾ oz. logwood in 70 oz. water and 1 oz. bluestone, and steep the wood for 24 hours. Take out, expose to the air for a long time, and then steep for 12 hours in a beck of iron nitrate at 4° B. If the black is not fine, steep again in logwood liquor.

6. It is customary to employ the clear liquid obtained by treating 2 parts powdered galls with 15 parts wine, and mixing the filtered liquid with a solution of iron protosulphate. Reimann recommends the use of water in the place of wine.

7. Almost any wood can be dyed black by the following means: Take logwood extract such as is found in commerce, powder 1 oz., and boil it in 3¼ pints water; when the extract is dissolved, add 1 drm. potash yellow chromate (not the bichromate), and agitate the whole. The operation is now finished, and the liquid will serve equally well to write with or to stain wood. Its color is a very fine dark purple, which becomes a pure black when applied to the wood.

8. For black and gold furniture, procure 1 lb. logwood chips, add 2 qt. water, boil 1 hour, brush the liquor in hot, when dry give another coat. Now procure 1 oz. green copperas, dissolve it in warm water, well mix, and brush the solution over the wood; it will bring out a fine back; but the wood should be dried outdoors, as the black sets better. A common stove brush is best. If polish cannot be used, proceed as follows: Fill up the grain with black glue—*i. e.*, thin glue and lampblack—brushed over the parts accessible (not in the carvings); when dry, smooth down with fine paper. Now procure, say, a gill of French polish, in which mix 1 oz. best ivory black, or gas black is best; shake it well until quite a thick pasty mass; procure ½ pt. brown hard varnish, pour a portion into a cup, add enough black polish to make it quite dark, then varnish the work; two thin coats are better than one thick coat. The first coat may be glass-papered down where accessible, as it will look better. A coat of glaze over the whole gives a London finish.

N. B.—Enough varnish should be mixed at once for the job to make it all one color—*i. e.*, good black.—*Smither.*

9. For Table.—Wash the surface of table with liquid ammonia, applied with a piece of rag; the varnish will then peel off like a skin; afterward smooth down with fine sandpaper. Mix ¼ lb. lampblack with 1 qt. hot water, adding a little glue size; rub this stain well in; let it dry before sandpapering it; smooth again. Mind you do not work through the stain. Afterward apply the following black varnish with a broad fine camel hair brush: Mix a small quantity of gas black with the varnish. If one coat of varnish is not sufficient, apply a second one after the first is dry. Gas black can be obtained by boiling a pot over the gas, letting the pot nearly touch the burner, when a fine jet black will form on the bottom, which remove, and mix with the varnish. Copper vessels give the best black: it may be collected from barbers' warming pots.

10. Boil 17·5 oz. Brazil wood and 0·525 oz. alum for one hour in 2·75 lb. water. The colored liquor is then filtered from the boiled Brazil wood and applied several times boiling hot to the wood to be stained. This will assume a violet color. This violet color can be easily changed into black by preparing a solution of 2·1 oz. iron filings and 1·05 oz. common salt in 17·5 oz. vinegar. The solution is filtered and applied to the wood, which will then acquire a beautiful black color.

11. Boil 8·75 oz. gall nuts and 2·2 lb. logwood in 2·2 lb rain water for one hour in a copper boiler. The decoction is then filtered through a cloth and applied several times while it is still warm to the article of wood to be stained, In this manner a beautiful black will be obtained.

12. This is prepared by dissolving 0·525 oz. logwood extract in 2·2 lb. hot rain water, and by adding to the logwood solution 0·035 oz. potash chromate. When this is applied several times to the article to be stained a dark brown color will first be obtained. To change this into a deep chrome black, the solution of iron filings, common salt and vinegar, given under 10, is applied to the wood, and the desired color will be produced.

13. Several coats of alizarine ink are applied to the wood, but every coat must be thoroughly dry before the other is put on. When the articles are dry the solution of iron filings, common salt, and vinegar, as given in 10, is applied to the wood, and a very durable black will be obtained.

14. According to Herzog, a black stain for wood, giving to it a color resembling ebony, is obtained by treating the wood with two fluids, one after the other. The first fluid to be used consists of a very concentrated solution of logwood, and to 0·35 oz. of this fluid are added 0·017 oz. alum. The other fluid is obtained by digesting iron filings in vinegar. After the wood has been dipped in the first hot fluid, it is allowed to dry, and is then treated with the second fluid, several times if necessary.

15. Sponge the wood with a solution of aniline chlorhydrate in water, to which a small quantity of copper chloride is added. Allow it to dry and go over it with a solution of potassium bichromate. Repeat the process two or three times, and the wood will take a fine black color.—*Mechanics' Own Book.*

16. Put iron filings, or the scales from a smith's forge, in a bottle, so as to fill it, say, a quarter full. Fill up with strong vinegar. Shake this up a couple of times a day for three or four days. Now boil some ground logwood in water, so as to make a strong decoction. Put this while hot on the wood, and before it is quite dry put on the vinegar and iron, When the wood is allowed to dry quite before the iron is put on, the inner grain of the wood remains red in places. Oil to get a good black. —*Amateur Work.* See Ebonizing below.

Blue.—1. Powder a little Prussian blue, and mix to the consistency of paint with bur; brush it on the wood, and when dry size it with glue dissolved in boiling water; apply lukewarm, and let this dry also; then varnish or French polish.

2. Indigo solution, or a concentrated hot solution of blue vitriol, followed by a dip in a solution of washing soda.

3. Prepare as for violet, and dye with aniline blue.

4. A beautiful blue stain is obtained by gradually stirring 0·52 oz. finely powdered indigo into 4·2 oz. sulphuric acid of 60%, and by exposing this mixture for twelve hours to a temperature of 77° F. (25° C.). The mass is then poured into 11 to 13·2 lb. rain water, and filtered through felt. This filtered water is applied several times to the wood, until the desired color has been obtained. The more the solution is diluted with water, the lighter will be the color.

5. 1·05 oz. finest indigo carmine, dissolved in 8·75 oz. water, applied several times to the articles to be stained. A very fine blue is in this manner obtained.

6. Prepare as for violet, and dye with aniline blue.

7. Brush it over with a strong, hot solution of nitrate of copper in water, and then go over the work with a hot solution of carbonate of soda (2 oz. to 1 pt. water).

8. Boil 1 lb. indigo, 2 lb. woad, and 3 oz. alum in 1 gal. water, and apply with a brush.

Brown.—1. Various tones may be produced by mordanting with potash chromate, and applying a decoction of fustic, of logwood, or of peachwood.

2. Sulphuric acid, more or less diluted, according to the intensity of the color to be produced, is applied with a brush to the wood, previously cleaned and dried. A lighter or darker brown stain is obtained, according to the strength of the acid. When the acid has acted sufficiently, its further action is arrested by the application of ammonia.

3. Tincture of iodine yields a fine brown coloration, which, however, is not permanent unless the air is excluded by a thick coating of polish.

4. A simple brown wash is ½ oz. alkanet root, 1 oz. aloes, 1 oz. dragon's blood, digested in 1 lb.

alcohol. This is applied after the wood has been washed with aqua regia, but is, like all the alcoholic washes, not very durable.

5. Dissolve 1·5 oz. finest indigo carmine in 8·75 oz. water, applied several times to the articles to be stained. A very fine blue is in this manner obtained.

6. Dissolve 3·5 oz. French verdigris in 3·5 oz. urine and 8·75 oz. wine vinegar. The solution is filtered and applied to the article to be stained. Then a solution of 2·1 oz. potash carbonate in 8·75 oz. rain water is prepared, and the article colored with the verdigris is brushed over with this solution until the desired blue color makes its appearance.

7. The newest processes of staining wood blue are those with aniline colors. The following colors may be chosen for the staining liquor: Bleu de Lyon (reddish blue), bleu de lumière (pure blue), light blue (greenish blue). These colors are dissolved in the proportion of 1 part coloring substance to 30 parts 90% alcohol, and the wood is treated with the solution.

8. Dr. Stolzel gives a recipe for staining wood of a brown color. He first of all paints over the wood with a solution made by boiling 1 part catechu (cutch or gambier) with 30 parts water and a little soda. This is allowed to dry in the air, and then the wood is painted over with another solution made of 1 part bichromate of potash and 30 parts water. By a little difference in the mode of treatment and by varying the strength of the solutions, various shades of color may be given with these materials, which will be permanent, and tend to preserve the wood.

9. Various tones may be produced by mordanting with chromate of potash, and applying then a decoction of fustic, of logwood, or of peachwood.

1. Cherry or Crimson Stain.—

Alkanet root	15	grn.
Aloes	30	grn.
Dragon's blood powdered	30	grn.
95% alcohol	500	grn.

Mix and let stand in a tightly corked bottle some days. Go over the wood with dilute (1 in 10) nitric acid first. This is pretty dark. You may lighten by using more alcohol.

2. For cherry stain, take of rain water, 3 qt.; annatto, 4 oz.; boil in a copper kettle till the annatto is dissolved, then put in a piece of potash the size of a walnut, keep it on the fire for half an hour longer, and it is ready to bottle for use. For rosewood stain, take alcohol, 1 gal.; camwood, 2 oz.; set them in a warm place twenty-four hours, then add extract of logwood, 3 oz.; aquafortis, 1 oz.; and when dissolved it is ready for use.

3. Red Stain for Bedsteads and Common Chairs.—Archil will produce a very good stain of itself when used cold; but if, after one or two coats being applied and suffered to become almost dry, it is brushed over with a hot solution of pearlash in water, it will improve the color.

4. To Give an Appearance of Age.—Boil ½ lb. madder and 2 oz. logwood chips in a gal. of water and brush well over while hot; when dry go over the whole with pearlash solution, 2 drm. to the qt.

5. Boil ½ lb. logwood in 3 pt. of water, and add ½ oz. salt of tartar. Stain the wood with the liquor boiling hot.

6. Boil in ½ lb. madder and ¼ lb. fustic in 1 gal. water; use hot, as before.

7. Boil 1 lb. Brazil wood and 1 oz. of washing soda in 1 gal. of water; apply hot, and then brush over it, before dry, a solution of 2 oz. alum in 1 qt. of water.

8. Ground Brazil wood, 1 lb.; water 3 qt.; cochineal, ½ oz.; boil the Brazil wood with water for an hour, strain, add the cochineal, boil gently for half an hour, when it will be fit for use. This is first applied, and then the varnish, consisting of 95% alcohol, ½ gal.; add 6 oz. gum sandarac, 3 oz. gum mastic, and ½ pt. turpentine varnish; put the above in a tin can by the stove, frequently shaking till well dissolved; strain, and keep for use. If you find it harder than you wish, thin with more turpentine varnish.

Ebonizing.—1. Boil 1 lb. logwood chips one hour in 2 qt. water; brush the hot liquor over the work to be stained, lay aside to dry; when dry give another coat, still using it hot. When the second coat is dry, brush the following liquor over the work: One oz. green copperas to 1 qt. hot water, to be used when the copperas is all dissolved. It will bring out an intense black when dry. For staining, the work must not be dried by fire, but in the sunshine, if possible; if not, in a warm room, away from the fire. To polish this work, first give a coating of very thin glue size, and when quite dry smooth off very lightly with No. 0 paper, only just enough to render smooth, but not to remove the black stain. Then make a rubber of wadding about the size of a walnut, moisten the rubber with French polish, cover the whole tightly with a double linen rag, put one drop of oil on the surface, and rub the work with a circular motion. Should the rubber stick, it requires more polish. Previous to putting the French polish on the wadding pledget, it ought to be mixed with the best drop black, in the proportion of ¼ oz. drop black to a gill of French polish. When the work has received one coat, set it aside to dry for about an hour. After the first coat is laid on and thoroughly dry, it should be partly papered off with No. 0 paper. This brings the surface even, and at the same time fills up the grain. Now give a second coat as before. Allow twenty-four hours to elapse, again smooth off, and give a final coat as before. Now comes spiriting off. Great care must be used here, or the work will be dull instead of bright. A clean rubber must be made, as previously described, but instead of being moistened with polish it must be wetted with 90% alcohol placed in a linen rag screwed into a tight even surface ball, just touched on the face with a drop of oil, and then rubbed lightly and quickly in circular sweeps all over the work from top to bottom. One application of spirits is usually enough if sufficient has been placed on the rubber at the outset, but it is better to use rather too little than too much at a time, as an excess will entirely remove the polish, when the work will have to be polished again. Should this be the case, paper off at once, and commence as at first. It is the best way in the end.—*Smither.*

2. Lauber dissolves extract of logwood in boiling water until the solution indicates 0° Baumé. Five pints of the solution is then mixed with 2½ pints pyroligneous iron mordant of 10° and ½ pint of acetic acid of 2°. The mixture is heated for one quarter of an hour, and is then ready for use.

3. To imitate black ebony, first wet the wood with a solution of logwood and copperas, boiled together and laid on hot. For this purpose, 2 oz. logwood chips with 1½ oz. copperas, to 1 qt. water, will be required. When the work has become dry, wet the surface again with a mixture of vinegar and steel filings. This mixture may be made by dissolving 2 oz. steel filings in ½ pint vinegar. When the work has become dry again, sandpaper down until quite smooth. Then oil and fill in with powdered drop black mixed in the filler. Work to be ebonized should be smooth and free from holes, etc. The work may receive a light coat of quick drying varnish, and then be rubbed with finely pulverized pumice and linseed oil until very smooth.

4. One gal. strong vinegar, 2 lb. extract logwood, ½ lb. green copperas, ¼ lb. China blue, and 2 oz. nut gall. Put these in an iron pot, and boil them over a slow fire till they are well dissolved. When cool, the mixture is ready for use. Add to the above ½ pint iron rust,

which may be obtained by scraping rusty hoops, or preferably by steeping iron filings in a solution of acetic acid or strong vinegar.

5. Common ebony *stain* is obtained by preparing two baths; the first, applied warm, consists of a logwood decoction, to every quart of which 1 drm. alum is added; the second is a solution of iron filings in vinegar. After the wood has dried from the first, the second is applied as often as is required. For the first named bath, some substitute 16 oz. gallnut, 4 oz. logwood dust, and 2 oz. verdigris, boiled in a sufficient quantity of water. A peculiar method of blackening walnut is in use in Nurnberg. On one of the Pegnitz Islands there is a large grinding mill, turned by the stream, where iron tools are sharpened and polished. The wood is buried for a week or more in the slime formed by the wheels; when dug out it is jet black, and so permeated by silica as to be in effect petrified. Another way to ebonize flat surfaces of soft work is to rub very fine charcoal dust into the pores with oil. This works beautifully with the European linden and American whitewood. A brown mahogany-like stain is best used on elm and walnut. Take a pint decoction of 2 oz. logwood in which ½ oz. barium chloride has been dissolved. This gives also, when diluted with soft water, a good oak stain to ash and chestnut. But the most beautiful and lasting of the browns is a concentrated solution of potash permanganate (mineral chameleon). This is decomposed by the woody fiber, and forms hydrated manganese oxide, which is permanently fixed by the alkali.

6. For the fine black ebony stain, apple, pear, and hazel wood are the best woods to use; when stained black, they are most complete imitations of the natural ebony. For the stain take: gall apple, 14 oz.; rasped logwood, 3½ oz.; vitriol, 1¾ oz.; verdigris, 1¾ oz. For the second coating a mixture of iron filings (pure), 3½ oz., dissolved in strong wine vinegar; 1½ pint is warmed, and when cool the wood already blackened is coated 2 or 3 times with it, allowing it to dry after each coat. For articles which are to be thoroughly saturated, a mixture of 1¾ oz. sal ammoniac, with a sufficient quantity of steel filings, is to be placed in a suitable vessel, strong vinegar poured upon it, and left for 14 days in a gently heated oven. A strong lye is now put into a suitable pot, to which is added coarsely bruised gall apples and blue Brazil shavings, and exposed for the same time as the former to the gentle heat of an oven, which will then yield a good liquid. The woods are now laid in the first named stain, boiled for a few hours, and left in it for 3 days longer; they are then placed in the second stain and treated as in the first. If the articles are not then thoroughly saturated, they may be once more placed in the first bath, and then in the second. The polish used for wood that is stained black should be white (colorless) polish, to which a very little finely ground Prussian blue should be added.

7. Wash with a concentrated aqueous solution of logwood extract several times; then with a solution of iron acetate of 14° B., which is repeated until a deep black is produced.

8. *Ebonized Wood Furniture.*—The following information is from the *Monthly Magazine of Pharmacy, etc.:*

Black Stains for Wood.—There are two kinds—the ordinary black stain for different kinds of wood and the black ebony stain for certain woods which approach nearer to ebony in hardness and weight. The ordinary black wood stain is obtained by boiling together blue Brazil wood, powdered gall apples and alum in soft water until it becomes black. This liquid is then filtered, and the objects painted with a new brush before the decoction has cooled, and this repeated until the wood appears of a fine black color; it is then coated with the following liquid: A mixture of iron filings, vitriol and vinegar is heated (without boiling), and left a few days to settle. If the wood is black enough, yet for the sake of durability it must be further coated with a solution of alum and nitric acid, mixed with a little verdigris, then a decoction of gall apples and logwood dyes are used to give it a deep black. Soft pear wood is preferable to all others for black staining. For the fine black ebony stain, apple, pear and hazel wood are the best woods to use; when stained black, they are most complete imitations of the natural ebony. For the stain take gall apple, 14 oz.; rasped logwood, 3½ oz.; vitriol, 1¾ oz.; verdigris, 1¾ oz. For the second coating a mixture of iron filings (pure), 3½ oz., dissolved in strong wine vinegar, ¾ of a liter (1½ pt. nearly), is warmed, and when cool the wood already blackened is coated 2 or 3 times with it, allowing it to dry between each coat. For articles which are to be thoroughly saturated a mixture of 1¾ oz. sal ammoniac, with a sufficient quantity of steel filings, is to be placed in a suitable vessel, strong vinegar poured upon it, and left for fourteen days in a gently heated oven. A strong lye is now put into a suitable pot, to which is added coarsely bruised gall apples and blue Brazil shavings, and exposed for the same time as the former to the gentle heat of an oven, which will then yield a good liquid. The woods are now laid in the first named stain, boiled for a few hours and left in it for three days longer; they are then placed in the second stain and treated as in the first. If the articles are not then thoroughly saturated, they may be once more placed in the first bath and then in the second. The polish used for wood that is stained black should be white (colorless) polish, to which a very little finely ground Prussian blue should be added.—*English Mechanic.*

9. Beech, pear tree, or holly steeped in a strong liquor of logwood or galls. Let the wood dry, and wash over with solution of iron sulphate. Wash with clean water, and repeat if color is not dark enough. Polish either with black or common French polish.

10. Oak is immersed for forty-eight hours in a hot saturated solution of alum, and then brushed over several times with a logwood decoction prepared as follows: Boil 1 part best logwood with 10 of water, filter through linen, and evaporate at a gentle heat until the volume is reduced one-half. To every qt. of this add 10 to 15 drops of a saturated solution of indigo, completely neutral. After applying this dye to the wood, rub the latter with a saturated and filtered solution of verdigris in hot concentrated acetic acid, and repeat the operation until a black of the desired intensity is obtained. Oak thus stained is said to be a close as well as handsome imitation of ebony.

11. One lb. logwood chips, 3 pt. water; boil to 1 pt.; apply hot to wood; *let dry*; then give another coat; let dry slowly; sandpaper smooth; mix 1 gill vinegar with 3 tablespoonfuls iron or steel filings; *let stand* five hours, then brush on wood; let dry; then give another coat of the first. This sends the vinegar deeper into the wood and makes a denser black; after which paper smooth. Then polish with white French polish, as the white brings out the black purer than common French polish. The woods observed to take on the stain best are pear tree, plane tree, and straight reeded birch; mahogany does not stain nearly so well as the former woods.

12. Get 1 lb. of logwood chips and boil them down in enough water to make a good dark color; give the furniture 3 or 4 coats with a sponge; then put some rusty nails or old iron into a bottle with some vinegar, and when it begins to work give the furniture a coat of the vinegar. This, if you have well darkened it with the first, will give you a good black. Oil and polish in the usual way, rubbing down first with fine paper if required. A quicker way is

to give the wood a coat of size and lampblack, and then use gas black in your polish rubber.

13. Make a strong decoction of logwood by boiling 1 lb. in 1 qt. water for about 1 hour; add thereto a piece of washing soda as large as a hazel nut. Apply hot to the wood with a soft brush. Allow to dry, then paint over the wood with a solution of iron sulphate (1 oz. to the pt. of water). Allow this to dry, and repeat the logwood and iron s lphate for at least 3 times, finishing off with logwood. Once more allow to dry thoroughly; then sandpaper off very lightly (so as not to remove the dye) with No. 0 paper. Now make a very thin glue size, boil in it a few chips of logwood and a crystal or two of iron sulphate, just sufficient to make it inky black. Paint this lightly over the work, allow to dry once more, again sandpaper lightly, and finally either varnish with good hard white varnish or polish with French polish and drop black.—*Mechanic's Own Book.*

Take 1 gal. of strong vinegar, 2 lb. extract of logwood, ½ lb. green copperas, ¼ lb. China blue, and 2 oz. nutgalls. Put these in an iron pot, and boil them over a slow fire till they are well dissolved. When cool, the mixture is ready for use. Add to the above ½ pt. iron rust, obtained by steeping iron filings in strong vinegar. The above makes a perfect jet black, equal to the best black ebony; and the recipe is a valuable one.—*Builder and Woodworker.*

Floors.—1. Get the wood clean, have some Vandyke brown and burnt sienna ground in water, mix it in strong size; put on with a whitewash or new paint brush as evenly as you can. When dry, give two coats of copal or oak varnish.

2. If the floor is a new one, have the border well washed. Polish with glasspaper, rubbing always with the grain of the wood. Varnish with good oak varnish, put coloring matter into the varnish to suit your taste, but umber is best; if the floor is old and blackened, paint it.

3. If old floors, you will not make much of staining anything but black. The floor is to be well washed (lime and soda is best—no soap), the dye painted on, and, when dry, sized over and varnished with elastic oak varnish.

4. Take ½ lb. logwood chips, boil them briskly for half an hour in about 5 qt. rain water, and strain through muslin. To this liquor add 6 oz. annatto (in the form of cake—not the roll); add also 1 lb. of yellow wax, cut up in very small pieces. Place these over the fire, and let the wax melt gently, stirring it all the while. When melted, take the mixture off the fire; do not let it boil. Then with a paint brush lay it on the floor as hot as possible, brushing it always the way of the grain. Next day polish with a hard, flat brush made of hair, which may have a strap nailed to the back of it, in which to insert the foot. The floor is afterward kept bright with beeswax alone, a little of which is melted and put on the brush. Take care that the floor is thoroughly dry before commencing operations.

5. Melt some glue size in a bottle; next get a piece of rag, roll it into a ball so that it will fit the hand nicely, cover this with a bit of old calico to make a smooth face; dip this into the size, and rub in a bit of brown umber; then go ahead with your floors, working the stuff light or dark as required. Keep the motion with the grain of wood; when dry, stiffen with polishers' glaze.

6. Take Judson's dyes of the color required, mix according to the instructions given with each bottle, and apply with a piece of rag, previously trying it on a piece of wood to see if color will suit; rub with sandpaper to get off any roughness that may be raised with the damp, and varnish with fine pale hard varnish, then slightly sandpaper and varnish again. Another method is to boil 1 lb. logwood in an old boiler, then apply with a piece of rag where the stain is required; when thoroughly dry, sandpaper as before, and well rub with beeswax to polish. This last process looks best when finished, but it requires a lot of elbow grease for a few months, and is extremely durable. To prevent the stain running where you do not want it, paste some stout paper.

Green.—1. Mordant the wood with red liquor at 1° B. This is prepared by dissolving separately in water 1 part sugar of lead and 4 parts of alum free from iron; mix the solutions and then add ⅛ part of soda crystals and let settle overnight. The clear liquor is decanted off from the sediment of lead sulphate, and is then diluted with water till it marks 1° B. The wood when mordanted is dyed green with berry liquor and indigo extract, the relative proportions of which determine the tone of the green.

2. Verdigris dissolved in 4 parts water.

3. Four and two-tenths oz. copper, cut up finely, are gradually dissolved in 13 oz. nitric acid (aquafortis), and the articles to be stained are boiled in this solution until they have assumed a fine green color.

4. Mordant the wood with red liquor at 1° B. This is prepared by dissolving separately in water 1 part sugar of lead and 4 parts of alum free from iron; mix the solutions and then add ⅛ of a part of soda crystals and let settle overnight. The clear liquor is decanted off from the sediment of sulphate of lead, and is then diluted with water till it marks 1° B. The wood when mordanted is dyed green with berry liquor and extract of indigo, the relative proportions of which determine the tone of the green.

The wood, mordanted, at above directed, can also be dyed a fine blue with extract of indigo.

5. Dyeing Veneers Green.—Put the veneers in a box or trough with clean water, and let them remain immersed for three or four days, changing the water once or twice as occasion may require. Let them dry about twelve hours before they are put into the dye; by observing this the color will strike quicker and be of a brighter hue. Prepare the dye as follows: To 1 gal. of strong vinegar add 1 lb. of the best verdigris finely ground, 2 oz. sap green and 2 oz. indigo. Place this in an iron or copper vessel, with as many of the veneers as the liquor will cover and boil for several hours or until the requisite intensity of color is obtained.

Gray.—1. Grays may be produced by boiling 17 oz. orchil paste for ½ hour in 7 pt. water. The wood is first treated with this solution, and then, before it is dry, steeped in a beck of iron nitrate at 1° B. An excess of iron gives a yellowish tone; otherwise a blue gray is produced, which may be completely converted into blue by means of a little potash.

2. One part silver nitrate dissolved in 50 parts of distilled water; wash over twice; then with hydrochloric acid, and afterward with water of ammonia. The wood is allowed to dry in the dark, and then finished in oil and polished.

Mahogany.—1. Boil ½ lb. madder and 2 oz. logwood chips in 1 gal. water, and brush well over while hot. When dry, go over with pearlash solution, 2 drm. to the qt. By using it strong or weak, the color can be varied at pleasure.

2. Soak 1 lb. stick varnish in 2 qt. water until all the color is dissolved out; strain off the water, and add to the residue 25 drm. powdered madder. Set the mixture over the fire until it is reduced to ¾ of its original volume. Then mix together 25 drm. cochineal, 25 drm. kermes berries, 1 pt. spirits of wine, and ½ oz. pearlash, out of which the color has been washed by soaking in a gill of soft water. Add this mixture to the decoction of madder and varnish, stirring well together, and adding so much aquafortis as will bring the red to the desired shade.

3. Dark Mahogany.—Introduce into a bottle 15 gr. alkanet root, 30 gr. aloes, 30 gr. powdered

dragons' blood, and 500 gr. 95% alcohol, closing the mouth of the bottle with a piece of bladder, keeping it in a warm place for 3 or 4 days, with occasional shaking, then filtering the liquid. The wood is first mordanted with nitric acid, and when dry washed with the stain once or oftener, according to the desired shade; then, the wood being dried, it is oiled and polished.

4. Light Mahogany.—Same as dark mahogany, but the stain being only applied once. The veins of true mahogany may be imitated by the use of iron acetate skillfully applied.

5. The following process is recommended in *Wiederhold's Trade Circular:* The coarse wood is first coated with a colored size, which is prepared by thoroughly mixing up, in a warm solution, 1 part commercial glue in 6 of water, a sufficient quantity of the commercial mahogany brown, which is in reality an iron oxide, and in color stands between so-called English red and iron oxide. This is best effected by adding in excess a sufficient quantity of the dry color with the warm solution of glue, and thoroughly mixing the mass by means of a brush until a uniform paste is obtained, in which no more dry red particles are seen. A trial coat is then laid upon a piece of wood. If it is desired to give a light mahogany color to the object, it is only necessary to add less, and for a darker color more, of the brown body color. When the coat is dry, it may be tested, by rubbing with the fingers, whether the color easily separates or not. In the former case, more glue must be added until the dry trial coat no longer perceptibly rubs off with the hands. Having ascertained in this way the right condition of the size color with respect to tint and strength, it is then warmed slightly, and worked through a hair sieve by means of a brush. After this, it is rubbed upon the wood surface with the brush, which has been carefully washed. It is not necessary to keep the color warm during the painting. Should it become thick by gelatinizing, it may be laid on the wood with the brush, and dries more rapidly than when the color is too thin. If the wood is porous and absorbs much color, a second coat may be laid on the first when dry, which will be sufficient in all cases. On drying, the size color appears dull and unsightly, but the following coat changes immediately the appearance of the surface. This coat is spirit varnish. For its production 3 parts 90% alcohol are added in excess to 1 part of red acaroid resin in one vessel, and in another 10 parts shellac with 40 of 80% alcohol. By repeated agitation for 3 or 4 days, the spirit dissolves the resin completely. The shellac solution is then poured carefully from the sediment, or better still, filtered through a fine cloth, when it may be observed that a slight milky turbidity is no detriment to its use. The resin solution is best filtered into the shellac solution by pouring through a funnel loosely packed with wadding. When filtered, the solutions of both resins are mixed by agitating the vessel and letting the varnish stand a few days. The acaroid resin colors the shellac, and imparts to it at the same time the degree of suppleness usually obtained by the addition of Venetian turpentine or linseed oil. If the varnish is to be employed as a coat, the upper layers are poured off at once from the vessel. One or two coats suffice, as a rule, to give the object an exceedingly pleasing effect. The coats dry very quickly, and care must be taken not to apply the second coat until the first is completely dry.

6. Boil 7·5 oz. madder, 8·75 oz. rasped yellow wood, for 1 hour in 5·5 lb. water, and the boiling liquor is applied to the articles until the desired color has been produced.

7. Digest 1·05 oz. powdered turmeric and 1·05 oz. powdered dragons' blood, 8·75 oz. of 80% strong alcohol, and when the latter seems to be thoroughly colored it is filtered through a cloth. The filtrate is heated and applied warm to the article.

8. Boil 17·5 oz. madder, 8·75 oz. ground logwood, for 1 hour in 5·5 lb. water. This is filtered while still warm, and the warm liquor is applied to the wood. When this has become dry, and it is desired to produce a darker mahogany color, a solution of 0·525 oz. potash carbonate in 4·4 lb. water is applied to the wood. This solution is prepared cold, and filtered through blotting paper.

9. Dissolve 0·35 oz. aniline in 8·75 oz. 90% alcohol. Then another solution of 0·35 oz. aniline yellow in 17·5 oz. 90% alcohol is made, and this is added to the aniline solution until the required reddish-yellow color is obtained. By adding a little of a solution of aniline brown (0·35 oz. aniline brown in 10·5 oz. 90% alcohol), the color is still more completely harmonized, and a tint very closely resembling mahogany can be given to elm and cherry wood with this mixture.

10. Boil 0·7 oz. logwood in 3·5 oz. water down to about ½. This is then filtered, and 0·12 oz. baryta chloride is dissolved in it.—*Mechanic's Own Book.*

11. Water, 1 gal.; madder, 8 oz.; fustic, 4 oz. Boil lay on with a brush while hot, and while wet streak it with black to vary the grain. This imitates Honduras mahogany. Madder, 8 oz.; fustic, 1 oz.; logwood, 2 oz.; water, 1 gal. Boil and lay on while hot. This imitates Spanish mahogany. Varnish in the usual way with the following: Put in a bottle 2 oz. gum sandarac, 1 oz. shellac, ½ oz. gum benjamin, 1 oz. Venice turpentine, 1 pt. 90% alcohol. Color red with dragon's blood, or yellow with saffron. Stand in a warm spot till gum dissolves, when strain for use.

12. Make a stain of Venetian red, adding a little ocher; put them in a stone jar, with a little glue, size, and water, and boil. The wood must be smoothly planed and sandpapered. Apply the stain hot with a lump of rag, and when well coated let it stand for a few minutes, and rub off as much as will come with clean rags. Then allow it to dry thoroughly, and sandpaper, using the finest flour paper, when it will be ready for varnishing. This makes a dull red, and shows the original grain of the wood. To make a brighter red use dragon's blood instead of Venetian red.

13. Boil 1 part logwood in 8 parts water. Apply this decoction to the wood. When dry give it two or three coats of the following varnish: 1 part dragon's blood dissolved in 20 parts of 90% alcohol.

14. Stain.—Rectified naphtha, 1 pint; amber resin, 4 oz.; gum shellac, 2 oz.; terra sienna, 1 oz.; dragon's blood, 1¼ oz. Let it stand in a warm place for two days; shake frequently. Strain through muslin before use. Varnish. Rectified naphtha, 1 pint; shellac, 4 oz.; resin, piece as large as an egg.

15. To Stain Beech a Mahogany Color.—Put 2 oz. of dragon's blood, broken in pieces, into a qt of 90% alcohol; let the bottle stand in a warm place, shake it frequently; when dissolved it is fit for use.

16. Imitation of Mahogany.—Plane the surface smooth, and rub with a solution of nitrous acid. Then apply with a soft brush 1 oz. of dragon's blood dissolved in about 1 pt. of alcohol, and with ⅛ of an oz. of carbonate of soda mixed and filtered. When the brilliancy of polish diminishes, it may be restored by the use of a little cold drawn linseed oil.

Metallic Stain for Wood.—Soaking the wood in a weak solution of nitrate of silver, and then exposing it to the light, will produce an intense black color. Another way is to boil some chips of logwood in water for about a quarter of an hour. Then wash the piece of wood with it three or four times, allowing it to dry after each washing. Lastly, wash the wood, by means of a common painting brush, with a

mixture prepared as follows: Put 1 oz. of steel or iron filings into 2 oz. of vinegar, keep the phial near the fire so as to be gently heated for about two hours, then decant the vinegar and keep it for use.

Oak.—1. Mix powdered ocher, Venetian red and umber, in size, in proportions to suit; or a richer stain may be made with raw sienna, burnt sienna and vandyke. A light yellow stain of raw sienna alone is very effective.

2. Darkening Oak.—Lay on liquid ammonia with a rag or brush. The color deepens immediately, and does not fade; this being an artificial production of the process which is induced naturally by age. Potash bichromate, dissolved in cold water and applied in a like manner, will produce a very similar result.

3. In Germany, the cabinet makers use very strong coffee for darkening oak. To make it very dark: Iron filings with a little sulphuric acid and water, put on with a sponge, and allowed to dry between each application until the right hue is reached.

4. Whitewash with fresh lime, and when dry brush off the lime with a hard brush, and dress well with linseed oil. It should be done after the wood has been worked, and it will make not only the wood, but the carving or moulding, look old also.

5. Use a strong solution of common washing soda, say one or two coats, until the proper color is obtained. Or you may try potash carbonate. Paper and finish off with linseed oil.

6. A decoction of green walnut shells will bring new oak to any shade, or nearly black.

7. A good method of producing the peculiar olive brown of old oak is by fumigation with liquid ammonia; the method has many advantages beyond the expense of making a case or room air tight and the price of the ammonia. It does not raise the grain, the work keeping as smooth as at first. Any tint, or rather, depth of the color, can be given with certainty; and the darker shade of color will be found to have penetrated to the depth of a veneer, and much farther where the end grain is exposed, thus doing away with the chance of an accidental knock showing the white wood. The coloring is very even and pure, not destroying the transparency of the wood. It is advisable to make the furniture from one kind of stuff, not to mix English oak with Riga, and so on. They both take the color well, but there is a kind of American red oak that does not answer well. In all cases care must be taken to have no glue or grease on the work, which would cause white spots to be left. The deal portions of the work are not affected in the least, neither does it affect the sap of oak. The best kind of polish for furniture treated in this manner is wax polish, or the kind known as egg shell polish. The process of fumigation is very simple. Get a large packing case, or better still, make a room in a corner of the polishing shop about 9 ft. long, 6 ft. high and 3 ft. 6 in. wide; paste paper over the joints; let the door close on to a strip of India rubber tubing; put a pane of glass in the side of box or house to enable you to examine the progress of coloring. In putting in your work see that it does not touch anything to hinder the free course of the fumes. Put two or three dishes on the floor to hold the ammonia; about ½ pt. is sufficient for a case this size. The ammonia differs in purity, some leaving more residue than other. Small articles can be done by simply covering them with a cloth, having a little spirits in a pot underneath. A good useful color can be given by leaving the things exposed to the fumes overnight. The color lightens on being polished, owing to the transparency thus given to the wood.—*Mechanic's Own Book.*

8. A good brown oak stain is produced by preparing the wood with a solution of 1 oz. catechu, boiled in 1½ pt. of water. When dry, brush over a solution of bichromate of potash, 1 oz. to 1½ pt. of water.

9. Equal parts of American potash and pearlash, 2 oz. each to about 1 qt. water, give a good oak stain. Use carefully, as it will blister the hands. Add water if the color be too deep.

Orange Stain.—Yellow or orange stains generally result from the use of nitric acid or turmeric. Thus 2·1 oz. finely powdered turmeric are digested for several days in 17·5 oz. 80% alcohol, and then strained through a cloth. This solution is applied to the articles to be stained. Nitric acid diluted with 3 parts of water is likewise used. A hot concentrated solution of picric acid can likewise be used.

Purple.—

1. Logwood chips	1	lb.
Water	¾	gal.
Pearlash	4	oz.
Powdered indigo	2	oz.

Boil the logwood in the water till the full strength is obtained, then add the pearlash and indigo, and when the ingredients are dissolved the mixture is ready for use, either warm or cold. This gives a beautiful purple.

2. To stain wood a rich purple or chocolate color, boil ½ lb. madder and ¼ lb. fustic in 1 gal. water, and when boiling brush over the work until stained. If the surface of the work should be perfectly smooth, brush over with a weak solution of nitric acid; then finish with the following: Put 4½ oz. dragon's blood and 1 oz. soda, both well bruised, into 3 pt. 90% alcohol. Let it stand in a warm place, shake frequently, strain and lay on with a soft brush, repeating until a proper color is gained. Polish with linseed oil or varnish.

3. Rasped logwood, 2·2 lb.; rasped Lima red dyewood, 5·5 lb., are boiled together for one hour in 5·5 lb. water. It is then filtered through a cloth and applied to the article to be stained until the desired color has been obtained. In the meanwhile a solution of 0·175 oz. potash carbonate in 17·5 oz. water has been prepared, and a thin coat of this is applied to the article stained red. But strict attention must be paid not to apply too thick a coat of this solution, or else a dark blue color will be the result.

Red.—The wood is plunged first in a solution of 1 oz. of curd soap in 35 fl. oz. of water, or else is rubbed with the solution, then magenta is applied in a state of sufficient dilution to bring out the tone required. All the aniline colors behave very well on wood.

Rosewood.—Take alcohol, 1 gal.; camwood, 2 oz., set them in a warm place twenty-four hours, then add extract of logwood, 3 oz.; aquafortis, 1 oz., and when dissolved it is ready for use.

Sixteenth Century Finish.—Oak may be given the appearance of age by sponging with sulphuric acid and water, equal parts, or, what is preferable, staining with umber in thin shellac varnish.

Violet.—The wood is treated in a bath made up with 4¼ oz. olive oil, the same weight of soda ash, and 2½ pt. of boiling water, and it is then dyed with magenta, to which a corresponding quantity of tin crystals have been added.

Violins, Stains for. See also Cherry Stains above.

To darken the wood rub over it nitric acid, sp. gr. 1·2, and, after standing twelve hours, wash and dry thoroughly. Then use either of the following:

1. Prepare a groundwork with strong hot aqueous solution of logwood extract; then apply a solution of 3 oz. potash, 3 oz. red sanders, 2½ lb. gum shellac, and 1 gal. water, dissolved over a quick fire.

2. Boil 1 oz. logwood extract in 1 pt. water (soft), and add ½ oz. cream of tartar. Use the stain hot, and give several coats if necessary, drying between each. Use a saw edged graining brush and asphaltum varnish, sufficiently thinned, to produce the proper markings.

Walnut Stains.—1. Light Walnut.—Dissolve 1 part potassium permanganate in 30 partsof pure water and apply twice in succession; after an interval of five minutes, wash with clean water and when dry oil and polish.

2. Dark Walnut.—Same as for light walnut, but after the washing with water the dark veins are made more prominent with a solution of iron acetate.

3. In the winter season get some privet berries (black), which grow in most gardens, and put 2 oz. in ½ pt. solution of liquid ammonia. This, applied, to pine, varnished or polished, cannot be detected from real walnut itself.

4. Take 1 gal. very thin size shellac; add 1 lb. dry burnt umber, 1 lb. dry burnt sienna, and ¼ lb. lampblack. Put these articles into a jug and shake frequently until they are mixed. Apply one coat with a brush. When the work is dry rub down with fine paper and apply one coat of shellac or cheap varnish. It will then be a good imitation of solid walnut and will be adapted for the back boards of mirror frames, for the back and inside of casework and for similar work.

5. Take 1 gal. strong vinegar, 1 lb. dry burnt umber, ½ lb. fine rose pink, ½ lb. dry burnt Vandyke brown. Put into a jug and mix well; let the mixture stand one day and it will then be ready for use. Apply this stain to the sap with a piece of fine sponge. It will dry in half an hour. The whole piece is then ready for the filling process. When the work is completed the stained part cannot be detected even by those who have performed the job. By means of this recipe wood of poor quality and mostly of sap can be used with good effect.

6. Darkening Walnut.—Slaked lime, 1 part, to 4 parts of water, will do for some kinds of walnut; a weak solution of iron sulphate for others; and yet again for other kinds a weak solution of pearlash. Try each on the wood and choose the one you like best.

7. To give to walnut a dark color resembling rosewood, Hirschberg uses a solution of 0·17 oz. potash bichromate in 1·05 oz. water. This solution is applied to the walnut with a sponge and the wood is then pumiced and polished.

8. By a simple staining, furniture of pine or birch wood can be easily made to appear as if it had been veneered with walnut veneer. For this a solution of 3·15 oz. potash manganate and 3·15 oz. manganese sulphate in 5·25 qt. hot water, is made. This solution is applied to the wood with a brush, and must be repeated several times. The potash manganate is decomposed when it comes in contact with the woody fiber, and thus a beautiful and very durable walnut color is obtained. If small wooden articles are to be stained in this manner, a very diluted bath is prepared; the articles are dipped into it, and kept there one to nine minutes, according as the color is desired lighter or darker.

9. Water, 1 qt.; sal soda, ½ oz.; Vandyke brown, 2½ oz.; potassium bichromate, ¼ to ½ oz.; boil for ten minutes, replacing water lost by evaporation. Use hot and allow the work to dry thoroughly before oiling or varnishing.

10. Reliable walnut stain for furniture, mostly hard wood. Spirits of turpentine, 1 gal.; pulverized asphaltum, 2 lb.; dissolve in an iron kettle on a stove, stirring constantly.

11. Boil 1 qt. water and add first 1½ oz. washing soda and then, a little at a time, 2½ oz. of Vandyke brown. When the foaming has nearly ceased add ¼ oz. bichromate of potassa dissolved in a little boiling water; stir well and filter through a cloth. The color may be deepened with a drop or two of Brunswick black or made of a warmer tone by increasing the amount of water and adding more bichromate of potassa. It should be applied with a brush quickly, and without much lapping; and when dry it takes a good coat of varnish.

12. Apply several coats of diluted asphalt varnish, or a solution of potassium permanganate, 1 oz. to the quart. Another process consists in treating with a hot solution of 1 oz. of extract of green walnut shells and when half dry, applying 1 oz. of potassium bichromate in 5 oz. of hot water.

13. Black Walnut. — A decoction of green walnut husks dried and boiled in lye is recommended.

14. Dragon's blood and lampblack mixed in wood alcohol may be used, well rubbed into the wood.

15. One gallon strong vinegar, 1 lb. dry burnt umber, ½ lb. fine rose pink, ½ lb. dry burnt Vandyke brown. After mixing and standing for a day it is ready for use. Apply with a sponge.

16. Take 1 lb. of logwood chips, ½ lb. of red sanders, ½ gal. of water. Boil over a fire until the full strength is obtained. Apply the mixture, while hot, to the wood, with a brush. Use one or two coats to obtain a strong, red color. Then take 1 gal. of spirits of turpentine and 2 lb. of asphaltum. Dissolve in an iron kettle on a stove, stirring constantly. Apply, with a brush, over the red stain, to imitate rosewood. To make a perfect black, add a little lampblack. The addition of a small quantity of varnish with the turpentine will improve it. This stain, applied to birch wood, gives as good an imitation of rosewood as on black walnut, the shade on the birch being a little brighter.

Yellow.—1. Mordant with red liquor, and dye with bark liquor and turmeric.

2. Turmeric dissolved in wood naphtha.

3. Aqua regia (nitro muriatic acid), diluted in 3 parts water, is a much used, though rather destructive yellow stain.

4. Nitric acid gives a fine permanent yellow, which is converted into dark brown by subsequent application of tincture of iodine.

5. Wash over with a hot concentrated solution of picric acid, and, when dry, polish the wood.

6. Orange Yellow Tone to Oak Wood.—According to Niedling, a beautiful orange yellow tone, much admired in a chest at the Vienna Exhibition, may be imparted to oak wood by rubbing it in a warm room with a certain mixture until it acquires a dull polish, and then coating it after an hour with thin polish, and repeating the coating of polish to improve the depth and brilliancy of the tone. The ingredients for the rubbing mixture are about 3 oz. tallow, ¾ oz. wax, and 1 pt. oil of turpentine, mixed by heating together and stirring.

7. Nitric acid (aquafortis), 0·5 oz., is compounded with 1·57 oz. rain water, and the article to be stained is brushed over with this. Undiluted nitric acid gives a brownish yellow color.

8. Digest 2·1 oz. finely powdered turmeric for several days in 17·5 oz. alcohol 80% strong, and then strain through a cloth. This solution is applied to the articles to be stained. When they have become entirely dry, they are burnished and varnished.

9. Dissolve 1·57 oz. potash carbonate in 4·2 oz. rain water. This solution is poured over 0·52 oz. annatto, and this mixture is allowed to stand for three days in a warm place, being frequently shaken in the meanwhile. It is then filtered, and 0·175 oz. spirit of sal ammoniac is added to it. The stain is now ready, and the articles to be stained will acquire a very beautiful bright yellow color by placing them in it.

10. Bright Golden Yellow. — Digest 0·52 oz. finely powdered madder for twelve hours with 2·1 oz. diluted sulphuric acid, and then filter through a cloth. The articles to be stained are allowed to remain in this fluid three to four days, when they will be stained through.

Staining Microscopical Preparations. See **Microscopy.**

Stamping Inks. *See* **Inks.**

Starches.—Relative Stiffening Strength of. —Starting with a pure starch obtained by maceration and infusion, and taking its stiffening

power as 100, we obtain the respective value of other starches, thus: Pure dry rice starch, 100; rice starch, No. 1, 95; rice starch, No. 2, 91; pure dry maize starch, 87; corn starch, 85; rye starch, 81; buckwheat starch, 81; oat starch, 80; acorn starch, 80; wheat starch, 80; barley starch, 78; Bermuda arrowroot, 75; Natal arrowroot, 73; pure potato starch, 68; potato farina, 65.

Lustrine Alsacienne (Starch Gloss).—

Borax	2½ oz.
Gum arabic	2½ oz.
Spermaceti	2½ oz.
Glycerine	6¾ oz.
Distilled water	2¼ pt.

A few drops of some sweet scented essence. Add 6 spoonfuls lustrine to 6¾ oz. boiling starch.

Laundry Starch.—Rub 1 oz. best potato starch up with a little cold water, so as to reduce all the lumps; add a tablespoonful of best loaf sugar, an equal quantity of dextrin, a little soluble indigo, and a lump of pure paraffin about the size of a nutmeg. Then add a pt. of boiling water, and boil, with occasional stirring, for half an hour (not less). The starch should be strained through a linen cloth before using.

Liquid Starch Glace.—One oz. each of gum arabic and borax are dissolved in 10 oz. of water; 1 oz. each of white wax and spermaceti are melted, and while liquid are rubbed with the solution of borax and 10 drops oil of cloves to make emulsion, mixing them thoroughly. A teaspoonful of this mixture in a pt. of starch gives a fine polish. It may also be applied after starching by rubbing over the starch with a cloth and then polishing with the iron.—*Pharm. Era.*

Starch, Gloss Liquid.—Borax, saturated solution, 2 parts; tragacanth mucilage, 1 part; mix. One tablespoonful to 1 pt. of starch.

To Improve Starch.—To each bowl of starch, add 1 teaspoonful of Epsom salts, and dissolve in the usual way by boiling. Articles starched with this will be stiffer, and will be rendered to a certain degree fireproof.

Use corn starch, boil to smooth paste, cool, and starch the goods; dry quickly. Before ironing, dampen down in thin, raw (unboiled) starch water. A little gum arabic or pure white wax is often added to the boiled starch to afford fine gloss. Iron in the usual way, with a common sad iron; then dampen slightly with a clean cloth and the starch (raw) water, and polish briskly with a polishing iron.

Starch Paste. See **Pastes.**

Starch, Potato.—Convert the potatoes into a pulp by means of a scraping knife or an instrument similar to a nutmeg grater; throw the pulp upon a fine linen cloth in a large funnel, and allow pure cold water to run through the mass slowly for several hours. By this means all the minute starch granules may be washed through the cloth; and on allowing the water to stand for some time, these will settle to the bottom, and may be removed by decanting the water and straining.

Statuary, Mould for. See **Moulds.**

Steam. See **Boilers, Safety Valve.**—Exhaust steam should never be discharged into a brick chimney. It is liable to disintegrate the mortar and thus to render the entire structure unstable.

Steam. *Steam Boiler Cement.* See **Cements.**

Steam, Velocity of.—Through a 6 inch pipe open at the end at 20 pounds pressure above the atmosphere the velocity is 1,413 feet; at 60 pounds pressure, 1,447; at 100 pounds pressure, 1,464 feet per second.

Stearine.—The solid portion of fats which is insoluble in cold alcohol. Melt pure strained mutton suet in a glass flask, with 7 or 8 times its weight of ether; let the solution cool. Place the pasty mass in a cloth, and press strongly, as rapidly as possible to avoid evaporation. Dissolve the solid portion in ether, and allow the solution to crystallize. The product will be nearly pure.

Steatite.—Soapstone, talc.

Steel, to Anneal. See **Annealing.**

Steel, to Blacken. See **Blacking** *Metals.*

Steel, to Blue. See **Bluing.**

Steel, to Bronze. See *Bronzing.*

Steel, to Brown. See **Browning Metal.**

Steel, Burnt, to Restore.—1. To 4 lb. fine white sand pulverized, add ½ lb. sal ammoniac, ¼ lb. copperas and ½ lb. resin, all pulverized. Mix well. When the steel is hot, sprinkle and let cool. This process will restore any burnt steel.

2. Sal ammoniac	1	lb.
Borax	3	lb.
Prussiate of potash	½	lb.
Rosin	2	oz.

Pulverize; add 2 gills each of water and alcohol, boil to a stiff paste in an iron kettle. The burnt steel is dipped while hot in the composition and hammered slightly.

3. Borax	4½	oz.
Sal ammoniac	12	oz.
Prussiate of potash	4½	oz.
Blue clay	3	oz.
Resin	⅜	lb.
Water	½	pt.
Alcohol	¼	pt.

Simmer over the fire till it dries to a powder. Heat the steel, dip in the powder and hammer.

4. Horn filings	3	parts.
Tallow	15	parts.
Sal ammoniac	1½	part.
Pulverized charcoal	1½	part.
Soda	1½	part.

Pulverize the hard materials, mix with the tallow. Heat the burnt steel to a cherry red and plunge in the mixture; when the steel becomes cold, it may be hardened in the usual manner.

Steel, Hard, to Drill.—Get some silver-steel wire and fit it to a pump drill; file the point long and trianglar; make it hot and plunge it into a wet bar of yellow soap; next, touch upon an oil stone short at the point, and drill with raw linseed oil or camphor and turps.

Steel, to Etch. See **Etching.**

Steel, Fluxes for. See **Fluxes.**

Steel, to Frost.—Clean and polish the metal, flow it quickly with dilute nitric acid; and, when the proper point is reached, wash well in running water.

Steel, to Gild. See **Gilding.**

Steel, to Harden. See **Hardening.**

Steel, Lacquers for. See **Lacquers.**

Steel, Thin, to Perforate.—Holes in hard steel may be made with nitric acid. To apply it, cover the steel plate, at the place where you wish the hole, with a thick layer of melted wax; when cold make a hole in the wax of the size you want the hole in the plate; then put on one or more drops of strong nitric acid; leave it on for some time; wash off with water, and, if not eaten through, apply other drops of the same liquid, and continue this until the plate is perforated.—*Ironmonger.*

Steel, to Polish. See **Polishing.**

Steel, to Prevent Rust on. See **Rust.**

Steel, to Soften.—Place a quantity of newly-burnt lime in a damp place, where it will

fall in the form of flour; put it in an iron box. Heat the articles to dull red; clean off all scale, and put in lime, and completely cover with lime; cover box over with iron lid and leave until cold. The more lime and larger the box, the better. Keep air tight if possible.

Steel, Solder for. See **Soldering.**

Steel, Softening.—One tablespoonful each hydrochloric acid and saltpeter to 1 gal. of water. Heat the steel and cool in it; then heat to soften by letting cool. Cast steel thus treated will weld with sand.

Steel, Straightening Hardened.—In hardening and tempering tools they sometimes spring, to the great annoyance of the workmen, and not seldom the tool is reheated and rehardened. In most cases this may be avoided. To straighten a piece of steel already heated and tempered, heat it lightly—not enough to draw the temper—and it may be straightened by blows from a hammer, if the character of the tool will admit of such treatment, or, as in case of a tap, it may be straightened by a heavy mallet on a hard wood block. Although the steel, when cold, would break like glass with this treatment, when slightly warmed it will yield to moderately heavy blows uninjured.

Steel, to Temper. See **Tempering.**

Steel, Composition to Toughen.—Resin, 2 lb.; tallow, 2 lb.; black pitch, 1 lb.; melt together and dip in the steel when hot.

Steel, to Weld. See **Welding.**

Stencil Inks. See **Inks.**

Stephenson's Alloy. See **Alloys**—*White Metal.*

Stereotype Composition. See **Cements,** *Jannin's.*

Stereotype Metal. See **Alloy.**

Stereotyper's Paste. See **Pastes.**

Sternutatories for Cold in the Head.—1. Witch hazel leaves, dried, 4½ parts; marjoram blossoms, 1½ parts; lavender blossoms, 1½ parts. Powder finely and mix.

2. Snuff, 12 parts; valerian leaves, 12 parts; a few drops oil of lavender and marjoram.

Stoichiometry, or Chemical Calculations.—Conversion of Thermometer Degrees.

°C to °R, multiply by 4 and divide by 5.

°C to °F, multiply by 9, divide by 5, then add 32.

°R to °C, multiply by 5 and divide by 4.

°R to °F, multiply by 9, divide by 4, then add 32.

°F to °R, first subtract 32, then multiply by 4, and divide by 9.

°F to °C, first subtract 32, then multiply by 5, and divide by 9.

To Find the Percentage Composition, having the Formula Given.—Find the molecular weight from the formula; then let wt.=weight.

$$\frac{\text{Molecular wt.}}{100} = \frac{\text{Wt. of constituent in a molecule}}{\text{Percentage of constituent}}$$

Or we may proceed thus:

Multiply the atomic weight of the element by 1, 2, 3, etc., according to the number of atoms of the element there are in the molecule; multiply the number thus obtained by 100, and divide by the molecular weight.

To Find the Weight of any Element Contained in any Given Weight of a Compound Substance.—

$$\frac{\text{Molecular wt.}}{\text{Given wt.}} = \frac{\text{Wt. of constituent in a molecule}}{\text{Required wt.}}$$

Or, multiply the atomic weight of the element by 1, 2, 3, etc., according to the number of atoms of the element there are in the molecule; multiply the number thus obtained by the given weight, and divide by the molecular weight.

To Find the Empirical Formula of a Body from its Percentage Composition.—Divide the percentage of each element by the atomic weight of that element to three places of decimals, and divide all the numbers thus obtained by the lowest; if the quotients are not whole numbers, reduce them to their simplest relation in whole numbers, and to these whole numbers prefix the symbol to which each refers.

To Find the Weight of a Substance Required to Yield, Liberate, or Produce a Given Weight of a Substance.—Write the equation expressing the chemical change; then—

Molecular weight of resulting substance x Number of molecules involved	:	Quantity of resulting substance given	:	Molecular weight of original substance x Number of molecules involved	:	Weight of original substance required

To Solve Problems Involving Volumes of Gases.—Write the equation expressing the chemical change, and underneath the gaseous product write the sign □□ for each molecule (if there are more than one), thus:

$$\underset{87}{MnO_2} + 4HCl = \underset{126}{MnCl_2} + \underset{□□}{Cl_2} + \underset{□□}{2H_2}$$

Four volumes of hydrochloric acid gas yield 1 volume of chlorine and 2 volumes of water vapor. Any problem is readily solved by this method with the aid of simple proportion. The following data must be borne in mind.

An atomic weight of an element taken in grammes occupies 11·2 liters, at 0° C. and 760 mm. pressure, but As and P occupy 5·6 liters, and Hg occupies 22·4 liters.

A molecular weight of a compound taken in grammes occupies 22·4 liters, unless the vapor density of the compound is abnormal.

One liter of hydrogen weighs 1 crith=0·0896 gramme.

Formula for Correcting the Volume of Gases for Temperature and Pressure.—

V = original volume.
V' = corrected volume.
t = original temperature C°.
t' = final temperature C°.
P = original pressure.
P' = final pressure.

$$\frac{V}{V'} = \frac{(273+t)P'}{273+t'\ P}$$

Stomach Bitters. See **Bitters.**

Stones, to Clean. See **Cleansing.**

Stoppers, to Remove.—1. My own trials in this direction indicate that there is no royal road to get out stoppers. I have tried many plans, but have found none more successful than that of tapping the bottle neck lightly and repeatedly, first in one place and then directly opposite, with the handle of a knife or another stopper. I have seen Prof. Roscoe, at Owens College, adopt this plan. He would also sometimes hold the neck over a Bunsen burner, and then begin knocking again. The nuisance is that you now and then decapitate the bottle, but I think all methods are liable to that misfortune.

Removing Stoppers.—2. The best way is to take a turn round neck with a stout string, hold the bottle firmly on the table with one hand, grasp one end of the string with the other, and get a friend to pull the other end. A little sawing will soon heat the neck sufficiently to expand it and loosen the stopper. I have extricated broken stoppers in this way, with nothing to lift them out by but a little bit of sealing wax melted into the broken surface. Try rubbing stopper with paraffin wax.—*Correspondence in English Mechanic.*

Stoppers, to Grind.—Glass stoppers can be made to fit tightly by grinding with emery. This operation can be performed either by hand or on the lathe.

Storm Glasses, *Liquid for* — 1. The red consists of alcohol slightly colored with a little aniline or logwood.

2. The white is composed of—

Camphor	2½ drm.
Alcohol	11 drm.
Water	9 drm.
Saltpeter	38 grn.
Sal ammoniac	38 grn.

Dissolve the camphor in the alcohol and the salts in the water and mix the solutions together. Pour in test tubes, cover with wax after corking and make a hole through the cork with a red hot needle, or draw out the tube until only a pin hole remains.

Indications of.—1. When the camphor, etc., appears soft and powdery, and almost filling the tube, rain, with S. or S. W. winds may be expected; when crystalline, N., N. E., or N. W. winds, with fine weather, may be expected; when a portion crystallizes on one side of the tube, wind may be expected from that direction. I had one for several years, and could fortell the weather for a day beforehand with considerable certainty by means of it, even apart from the barometer.—*W. J. Lancaster, in English Mechanic.*

2. The following indications are from another source:

Fine Weather.—The substance remains entirely at bottom of tube and the liquid perfectly clear.

Coming Rain.—Substance will rise gradually, liquid will be very clear, with a small star in motion.

A Coming Storm or Very High Wind.—Substance partly at top of tube, and be of a leaf-like form, liquid very heavy and in a fermenting state. These effects are noticeable twenty-four hours before the change sets in.

In Winter.—Generally the substance lies higher in the tube.

Snow or White Frost.—Substance very white, and small stars in motion.

Summer Weather.—The substance will lie quite low. The substance will lie closer to the tube on the opposite side to the quarter from which the storm is coming.

Stoves, to Blacken. See **Blacking,** *Stove.*

Stoves, to Prevent Rusting.—Kerosene applied with a rag to stoves will keep them from rusting during the summer. It is also an excellent material to apply to all iron utensils used about a farm.

Stoves, to Mend Cracks, etc.—When a crack is discovered in a stove, through which the fire or smoke penetrates, the aperture may be completely closed in a moment with a composition consisting of wood ashes and common salt, made up in paste with a little water, and plastered over the crack. The good effect is equally certain, whether the stoves, etc., be cold or hot.

Stoves, to Polish.—For a stove of medium size, pulverize a piece of alum the size of a large hickory nut, stir into two tablespoonfuls of vinegar, add this to the stove blacking, mixed with water in the usual manner. Apply this mixture with a cloth or brush to a cold stove, and while wet rub briskly with a dry brush. The polish will appear at once.

Stoves, Varnish for. See **Varnishes.**

Strass.—

Pure caustic potash	16 parts.
White lead	85 parts.
Boracic acid	4½ parts.
Arsenious acid	⅛ part.
Fine white sand	50 parts.

These materials are carefully selected, placed in a Hessian crucible, and fused in a porcelain furnace for a day and a night, then cooled very gradually. Used to imitate the diamond. Other precious stones are imitated by adding to the strass the metallic oxides, as in colors for glass.

Stratena Cement. See **Cements.**

Straw, to Bleach. See **Bleaching.**

Straw, to Dye. See **Dyeing.**

Straw, to Give a Luster to.—An ammoniacal solution of bleached lac is employed by some makers.

Straw Plait.—This is bleached by exposing it to the fumes of burning sulphur in a close chest or box, or by immersing it in a weak solution of chloride of lime, and afterward washing it well in water. Water, strongly acidulated with oil of vitriol or oxalic acid, is also used for the same purpose. Straw may be dyed with any of the simple liquid dyes.

Strawberry. See **Liquors.**

Strawberry Flavoring. See **Essences and Extracts.**

Strawberry Syrup. See **Syrups.**

Strops, Razor, Pastes for. See **Razors.**

Stucco. See **Cements,** *Keene's.*

Stumps of Trees, to Destroy.—In the fall bore a hole in the center of the stump, about 18 in. deep, and 1 to 1½ in. in diameter. Put in about 2 oz. saltpeter, and fill the hole with water; plug it up tight. In the spring, take out the plug, pour in 8 or 10 oz. petroleum, ignite, and the stump will smolder, but not blaze, to the extremities of the roots, leaving only ashes. Dynamite is also extensively used.

Stiles. See **Eyes, the.**

Styptics, Hæmostatics.—Substances which arrest local bleeding. Creosote, tannin or tannic acid, strong spirit, alum, sulphate of iron, and most of the astringent salts and other astringent substances, belong to this class. The following are a few preparations of this kind: *Hæmostatic Powder, Styptic Powder.*—

1. Alum (in fine powder)	1	part.
Gall nuts (in fine powder)	1	part.
Gum arabic (in fine powder)	1	part.
Gum benzoin (in fine powder)	1	part.
Mix.		
2. Guibourt.—		
Charcoal (in fine powder)	1	part.
Gum arabic (in fine powder)	1	part.
Resin (in fine powder)	4	parts.
3. Mialhe.—		
Alum (powdered)	1	part.
Gum tragacanth	1	part.
Tannin (tannic acid)	1	part.

Used to stop local bleeding, a little being sprinkled or pressed on the part.

Sublimation.—The process by which a volatile substance is converted into vapor and condensed into solid form. If a volatile substance is converted into a vaporous state and this vapor when condensed forms a solid, the process is called a sublimation, and the product is called a sublimate; if, on the other hand, the condensed vapors yield a liquid, the process is distillation (which see), and the product a distillate.

Sugar, Grape.—Glucose, Diabetic Sugar, Starch Sugar, Sugar of Fruits.—1. (From dried raisins.) Pound them, wash with cold alcohol, press, dissolve the cake in water, and proceed as last.

2. From diabetic urine, by evaporation, washing the mass in cold alcohol, redissolving in water, and crystallizing.

3. (From Starch).—Starch, 100 parts; water, 400 parts; sulphuric acid, 1 to 10 parts; boil for thirty-five or forty hours, adding water to make up for evaporation; then saturate the acid with lime or chalk, and evaporate. Under pressure, the conversion is produced much quicker. Product, 105 parts.

4. (From Woody Fiber).—Shreds of linen or paper, 12 parts; strong sulphuric acid, 17 parts (Braconnot); 5 parts acid and 1 part water, (Vogel); mix in the cold; in twenty-four hours dilute with water, and boil for ten hours; then neutralize with chalk, filter, evaporate to a syrup, and set the vessel aside to crystallize. Product, 114% of the weight of the rags. Sawdust, glue, etc., also yield grape sugar by like treatment.

Sugar, Lemon.—Portable Lemonade, *Saccharum Limonatum.*—Sugar, 4 lb.; tartaric acid, 3 oz.; essence of lemons, ¼ oz. Used to make lemonade, etc.

Sugar of Milk.—*Syn.* *Saccharum Lactis*, Lactine.—*Prep.* Evaporate clarified whey till it crystallizes, and purify the crystals by digestion with animal charcoal and repeated crystallization.

Sulphuret.—*Syn.* Sulphide, Sulphuretum, *Sulphidum*, L.

Sulphuric Acid.—This is made on such a large scale that directions for preparing would be useless, and pertain more to a book of processes. There are, however, a few forms of the acid which it will be well to describe.

Sulphuric Acid, Alcoholized (Paris Codex).—To 3 parts of alcohol (rectified) add very gradually, 1 part of sulphuric acid. Color by letting it stand over a little cochineal.

Sulphuric Acid, Anhydrous.—Heat Nordhausen acid to about 100° F., in a glass retort connected with a well cooled receiver, when the anhydrous acid will be formed.

2. Raise anhydrous sodium bisulphate to a low red heat in an earthen retort, then distill.

Sulphuric Acid, Aromatic.—Sulphuric acid, 3½ fl. oz.; alcohol, 30 fl. oz.; mix. Add 1½ oz. powdered cinnamon; powdered ginger, 1 oz.; digest for six days and filter.

2. Sulphuric acid, 3 parts; alcohol, 40 parts; cinnamon in powder, 2 parts; ginger in powder, 1¼ parts; mix the acid gradually with the alcohol, add the powders, macerate for seven days and filter.

Nordhausen Acid.—Disulphuric or fuming Sulph. acid. This acid is prepared by the distillation of iron sulphate in earthen retorts; used for dissolving indigo.

Sumac, Sumach, Shumac.—This consists of the leaves, leafstalks and small twigs of rhuscotinus, a shrub growing in Sicily, Italy, Spain, Portugal and some districts of France. It is sometimes sold whole, sometimes coarsely bruised, but most commonly ground to a fine powder; a preparation which enables it to be somewhat more readily extracted by cold water, but at the same time disguises the presence of impurities.

Sunburn. See **Cosmetics.**

Sunstroke.—Sunstroke is caused by excessive heat, and especially if the weather is muggy. It is more apt to occur on the second, third, or fourth of a series of hot days than on the first. Loss of sleep, worry, excitement, close sleeping rooms, debility, abuse of stimulants, predispose to it. It is more apt to attack those working in the sun, and especially between the hours of eleven o'clock in the morning and four o'clock in the afternoon. On hot days wear thin clothing. Have as cool sleeping rooms as possible. Avoid loss of sleep and all unnecessary fatigue. If working indoors and where there is artificial heat (laundries, etc.), see that the room is well ventilated. If working in the sun, wear a light hat (not black, as it absorbs the heat), straw, etc., and put inside of it, on the head, a wet cloth or a large green leaf; frequently lift the hat from the head and see that the cloth is wet. Do not check perspiration; but drink what water you need to keep it up, as perspiration prevents the body from being overheated. Have, whenever possible, an additional shade, as a thin umbrella when walking, a canvas or board cover when working in the sun. If a feeling of fatigue, dizziness, headache, or exhaustion occurs, cease work immediately, lie down in a shady and cool place, apply cold cloths to and pour cold water over head and neck. If any one is overcome by the heat, send immediately for the nearest good physician. While waiting for the physician, give the person cool drinks of water or cold black tea, or cold coffee, if able to swallow. If the skin is hot and dry, sponge with or pour cold water over the body and limbs, and apply to the head pounded ice wrapped in a towel or other cloth. If there is no ice at hand, keep a cold cloth on the head and pour cold water on it, as well as on the body. If the person is pale, very faint, and pulse feeble, let him inhale ammonia for a few seconds, or give him a teaspoonful of aromatic spirits of ammonia in two tablespoonfuls of water with a little sugar.

Suppositories.—These are combinations of medicinal substances with cocoa butter, suet, soap, etc., made into suitable form, round, cylindrical or conical, for introduction into the rectum. When made with cocoa butter or suet, these should be melted at gentle heat, with sufficient white wax (one twelfth to one eighth, according to the season of the year) to give suitable consistence, and the medicinal substance being then thoroughly incorporated, the whole is poured into suitable moulds to cool. With but little ingenuity, moulds, in the absence of metallic ones made for this purpose, may be made from stiff paper, and may be supported while filling and cooling by placing them upright in dry sand; or they can be moulded into suitable form with the fingers. A suppository should not ordinarily weigh more than a drachm, and should not exceed in size the point of the little finger. When introduced into the rectum the suppository melts or is dissolved, and the medicinal substance then develops its effects. This is an excellent form for administering medicine in many cases, and is less frequently used than it deserves.

Swedish Matches. See **Matches.**

Sympathetic Inks. See **Inks.**

Syrups, the Preparation of.—In the preparation of syrups, which are solutions of sugar, more or less strong according to the object for which they are used, care should be taken to employ only the best refined sugar, and either distilled or filtered rain water, as they will be rendered much less liable to spontaneous decomposition and become perfectly transparent without the trouble of clarifying. When, however, impure sugar is employed, clarification is always necessary. This is best done by dissolving the sugar in the water or fruit juices cold, and then beating up a little of the cold syrup with some white of egg and one or two ounces of cold water, until the mixture froths well; this must be added to the syrup in the boiler, and when the whole is frisked up to a good froth, heat should be applied and the scum which forms removed from time to time with a clean skimmer. As soon as the syrup begins to simmer it must be removed from the fire and allowed to stand until it has cooled a little, when it should again be skimmed, if necessary, and then passed through a clean flannel. By using refined sugar, however, all this trouble of clarification can be avoided.

When vegetable infusions or solutions enter into the compositions of syrups, they should be rendered perfectly transparent by filtration or clarification before being added to the sugar.

The proper quantity of sugar for syrups will, in general, be found to be two pounds avoirdupois to every pint of water or thin aqueous fluid. These proportions allow for the water that is lost by evaporation during the process and are those best calculated to produce syrup of proper consistence and possessing good keeping qualities. They closely correspond to those recommenned by Guibourt for the pro-

duction of a perfect syrup, which, he says, consists of 30 parts of sugar to 16 parts of water.

In the preparation of syrup it is of great importance to employ as little heat as possible, as a solution of sugar, even when kept at a temperature of boiling water, undergoes slow decomposition. The best plan is to pour the water (cold) over the sugar, and to allow the two to lie together for a few hours in a covered vessel, occasionally stirring, and to apply a gentle heat, preferably that of steam or of a water bath, to finish the solution. Syrups are sufficiently boiled when some, taken up in a spoon, pours out like oil, or a drop cooled on the thumb nail gives a proper thread when touched. When a thin skin appears on blowing the syrup, it is judged to be completely saturated. These rude tests, however, often lead to errors, which might be easily prevented by employing the proper proportions, or determining the specific gravity by immersing in the syrup one of Baumé's saccharometers or syrup gauges, as indicated in the following table:

Sugar in 100 parts.	Sp. Gr.	Deg. Baumé.
0	1·000	0
5	1·020	3
10	1·040	6
15	1·062	8
20	1.081	11
25	1·104	13·5
30	1·128	16·3
35	1·152	19
40	1·177	21·6
45	1·204	24·5
50	1·230	27
55	1·257	29·5
60	1·284	32
67	1.321	35

A fluid ounce of saturated syrup weighs 577½ grains; a gallon weighs 13½ pounds; its specific gravity is 1·319 to 1·321, or 35° Baumé; its boiling point is 220° F., and its density at the temperature of 212° is 1·260 to 1·261, or 30° Baumé. The syrups prepared with the juices of fruits mark about two or three degrees more on Baumé scale than the other syrups. According to Ure, the decimal part of the number denoting the specific gravity of a syrup multiplied by twenty-six gives very nearly the number of pounds of sugar it contains per gallon.

The preservation of syrups, as well as of all saccharine solutions, is best promoted by keeping them in a moderately cool, but not a very cold place. Let syrups be kept in vessels well closed, and in a situation where the temperature never rises above 55° F. They are kept better in small than in large vessels, as the longer a bottle lasts the more frequently will it be opened, and the syrup consequently exposed to the air. By bottling syrups while boiling hot, and immediately corking down and tying the bottles over with a bladder, perfectly air-tight, they may be preserved even at a summer heat for years, without fermenting or losing their transparency.

The candying of syrups may be prevented (unless the syrup be over-saturated with sugar) by the addition of acetic or citric acid, two or three drm. per gallon. Confectioners add a little cream of tartar to the syrup to prevent granulation. Syrup may be effectually prevented from fermenting by the addition of a little sulphite of potassa or lime; also by the use of salicylic acid in small quantities. Fermenting syrups may be immediately restored by exposing the vessel containing them to the temperature of boiling water. The addition of a little spirit is also good, say about ten per cent.

A solution of sugar prepared by dissolving two parts of double refined sugar in one of water, and boiling this a little, affords a syrup which neither ferments nor crystallizes.

The best way to keep fruit syrups from fermenting is by bottling while hot, into suitable bottles or larger vessels, and to prevent access of air. This is the principle, and it may be caried out in various ways. For instance, fill the syrup while hot in quart bottles, previously warmed, and fill them almost full. Cover or cork the bottles temporarily until the syrup cools a little and contracts in volume; then, having heated a small quantity of the syrup, refill the bottles, cork them securely, and wax them.

A great variety of syrups are made by the addition of proper flavoring ingredients to simple syrup; but in other cases, especially when the juices of fruits are employed, the syrup is not first prepared and then flovored, but the processes go hand-in-hand. In such instances specific instructions will be given. It is always advisable, when fresh fruit can be obtained, to use it in preference to the essence. One general recipe, which answers for nearly all fresh fruit, is as follows: Use nothing but the very best fresh fruit, which must be freed from stocks, etc., and crushed with a wooden instrument (not metal); when well mashed, let it stand in a room of even temperature (about 68° F.) for 4 days, which will give sufficient time for fermentation to take place; press out the juice from the fruit and let it settle in a cool cellar for 2 days, after which 5 pounds of the clear juice is to be simmered with 9 pounds of loaf sugar; while warm, strain through flannel. The color may be improved by a solution of some coloring agent.

It is advisable to add to the fresh fruit, before setting it for fermentation, about two pounds of powdered loaf sugar for every hundred pounds of fruit. When cold, it is ready for bottling. Cleanliness should be strictly observed in all the utensils used. When bottling for storing, skim the top of any floating matter from the syrups in the large pan, and see that no residue at the bottom goes into the bottles. Most of the syrups not made of fruit may have a little mucilage of gum arabic added, in order to produce a rich froth. The following recipes comprise syrups made from the fruit and also from essences. These may be varied to suit taste and requirements. A variety of syrups have been brought into use by adding the various wines, such as claret, hock, sherry, etc., to simple syrup; others, by the addition of spirits, as milk punch, by adding to vanilla cream Jamaica rum and nutmeg. Almost any syrup may be made by the addition of a sufficient quantity of flavoring essence to simple syrup; but these artificially prepared syrups are inferior to those made from fresh fruits.

Red Coloring for Soda Water Syrups.—The most convenient is probably tincture of cudbear, as it affords a good, substantial and natural-looking color, miscible with syrups without cloudiness. It may be made as follows: 2 to 4 oz. powdered cudbear, 1 pt. diluted alcohol. Exhaust by maceration or displacement. Used alone, the tincture gives a shade of red closely imitating the color of raspberries or currants. For deeper red, like blackberries, the addition of some caramel is all that is necessary. The strawberry color is best imitated with tincture of cochineal. Aniline red, owing to its cheapness, is often used for coloring syrups, but it produces a glaring, artificial-looking bluish-red, and is liable to the objection that it sometimes contains arsenic.

To Make the Syrups Frothy.—To each gal. of syrup add from 2 to 4 oz. of gum arabic, dissolved in its own weight of water.

Preparation of Syrups.—In discussing at some length the various pharmacopœial methods for the preparation of syrups, W. Bernhardt, in a recent contribution to the *Deutsch-Amerikanische Apotheker Zeitung*, comes to the conclusion that with but very few exceptions—where heat would deleteriously affect

the product—dissolving the sugar by heat and raising to the boiling point is the best. To insure the best results, the author lays down these rules:

1. Employ only the best grade of cane sugar, for the lower grades of sugar contain appreciable amounts of glucose which inclines to fermentation. Follow closely the quantities directed in formula. Concentrated saccharine solutions resist termentation in a much higher degree than more dilute ones; on the other hand, there will be loss from crystallization if syrups, prepared by heat, are stored in a cool room, as is sometimes done.

2. Use none but absolutely clear vegetable extracts, seeing to it that after ebullition the syrup may also be perfectly bright; the latter object may be accomplished by the customary aids, such as the addition of albumen or pure filtering paper pulp before bringing the syrup to a boil. This does not apply; of course, to naturally turbid syrup, as, for instance, syrup of almonds.

The author sets forth that even with most aromatic syrups the loss of volatile constituents can be but trifling if the process of boiling be properly conducted; the inversion of saccharose may be left out of consideration, especially when fruit acids are absent—provided the solution of the sugar be completed at a low temperature, and then rapidly raised to the boiling point; albuminous substances are frequently extracted from the raw material which boiling will remove; all fermentative germs and fungus spores are effectually destroyed by the heat.

Finally, to insure perfect preservation, syrups should be filled into small vials of from two to eight ounces capacity, according to individual needs) which have been placed into boiling hot water, the vials to be immediately corked and sealed. As an extra precaution it is well to lay the filled and corked bottles on their sides, while yet hot, and to maintain that position. A French proposition is to fill the bottles to the brim, and, while the contents are still warm, to place on top, so as to come in contact with the syrup, a circular piece of filtering paper. A firm cover of crystallized sugar is thus obtained, well calculated to exclude all extraneous matter.—*Western Druggist.*

Ambrosia Syrup for Soda Water.—

1. Raspberry syrup	5	pt.
Vanilla syrup	5	pt.
Hock wine	10	oz.

Mix.

2. Raspberry syrup	2	pt.
Vanilla syrup	2	pt.
Hock wine	4	oz.

3. Ambrosia Syrup.—A mixture of equal parts of vanilla and strawberry syrups.

Apple Syrup.—Proceed with apples as for pine apple syrups.

Banana Syrup.—

1. Oil of banana	2	drm.
Tartaric acid	1	drm.
Simple syrup	6	pt.

2. Proceed with bananas as for pine apple syrups.

Blackberry Syrup.—1. Prepared from ripe fruit the same as raspberry syrups. Blackberry syrup is improved by adding 1 oz. best French brandy to each quart.

2. Prepare like either strawberry or mulberry syrup.

To Bleach Syrups.—Syrups may be bleached by agitation with or filtration through animal charcoal.

Capillaire (Maidenhair) Syrup.—

1. Maidenhair	8	oz.
Boiling water	5	pt.
Orange flower water	4	oz.
Sugar, sufficient.		

Infuse the maidenhair in the boiling water; when nearly cold, press out, and filter the liquid, add too it the orange flower water, and dissolve it in sugar, in the proportion of 7 oz. to each 4 fl. oz. of liquid.

2. Nine pounds loaf sugar, 4 lb. orange flower water. Boil till the sugar is dissolved and the syrup is clear; while hot, strain through flannel; add to the cool syrup 2 drm. of tartaric acid, previously dissolved in ½ oz. of the strongest orange flower water; lastly add 4 oz. of the best Rhine wine.

Capsicum Syrup.—

Tincture of capsicum	1	oz.
Simple syrup	2	pt.

Heat the syrup, add the tincture, and when the alcohol has evaporated, mix immediately.

Catawba Syrup.—

1. Simple syrup	1	pt.
Catawba wine	1	pt.
2. Catawba wine	2	qt.
Citric acid	2	oz.
Simple syrup	2	gal.

Champagne Syrup.—

1. Rhine wine	2	pt.
Brandy	2	oz.
Sherry	1	oz.
Granulated sugar	3	lb.

Dissolve the sugar without heat.

2. Rhine wine (Bodenheimer or Laubenheimer)	2	qt.
Cognac	4	oz.
Sherry	2	oz.
Granulated sugar	6	lb.

Dissolve the sugar in the wine without heat.

Sherry Cobbler Syrup.—

White syrup	3	pt.
Sherry	1	qt.

Add 1 lemon, cut in thin slices. Macerate for twelve hours and strain.

Cherry Syrup.—Take sour cherries, a convenient quantity, bruise them in a porcelain, stone or wood mortar, to break the stones or pits of the fruit; express the juice, set it aside for three days to undergo fermentation, and proceed according to the directions given for strawberry syrup.

Wild Cherry Syrup.—

Wild cherry bark (in coarse powder)	5	oz.

Moisten the bark with water, and let it stand for twenty-four hours in a close vessel. Then pack it firmly in a percolator, and pour water upon it until 1 pt. of water is obtained.

To this add—

Sugar	28	oz.

Chocolate Syrup.—

1. Best chocolate	8	oz.
Water	2	pt.
White sugar	4	lb.

Mix the chocolate in water, and stir thoroughly over a slow fire. Strain, and add the sugar.

2. Bark of roasted cacao bean	2	oz.

Reduce to a moderately fine powder, mix with—

Simple syrup	2	oz.

Pack in a percolator, and exhaust with the following menstruum at a boiling temperature:

Sugar	12	oz.
Water	8	oz.

So as to obtain 1 pt. of syrup. To the percolate add, when cold—

Extract of vanilla	2	fl. drm.

Cinnamon Syrup.—

Oil of cinnamon	30	min.
Carbonate of magnesia	60	grn.
Water	2	pt.
Sugar, granulated	56	oz.

Rub the oil first with the carbonate of magnesia, then with the water gradually added, and filter through paper. In the filtrate dissolve the sugar without heat.

Coffee Cream Syrup.—

Coffee syrup	2	pt.
Cream	1	pt.

Coffee Syrup.—

1. Coffee, roasted	½	lb.
Boiling water	1	gal.

Enough is filtered to make ½ gal. of the infusion to which add—

Granulated sugar	7	lb.
2. Ground Java coffee	2	oz.
Simple syrup	2	fl. oz.

Mix and pack in a percolator, and add, boiling hot, a mixture of—

Loaf sugar	12	oz. av.
Distilled water	8	fl. oz.

To percolate 1 pt. of syrup.

3. Take of—

Ground, roasted coffee	4	oz.
Boiling water	2	pt.
Sugar (com.)	4	lb.

Infuse the coffee in the water until cold, strain, add the sugar, and make a syrup.

Cream Syrup.—

1. Fresh cream	½	pt.
Fresh milk	½	pt.
Powdered sugar	1	lb.

Mix by shaking, and keep in a cool place. The addition of a few grains of bicarbonate of soda will for some time retard souring.

2. Oil of sweet almonds	2	oz.
Powdered gum arabic	2	oz.
Water	4	oz.

Make an emulsion, and add simple syrup enough to complete 2 pt.

3. One pt. condensed milk, 1 pt. water, 1¼ lb. sugar. Heat to boiling and strain. This will keep for over a week in a cool place.

4. Imitation.—Make an emulsion with 3 oz. fresh oil of sweet almonds, 2 oz. powdered gum arabic, and 2 oz. water; then dissolve 1 lb. white sugar by gentle heat, strain, and when cool, add the whites of 2 eggs. It should be put up in small bottles, well corked, in a cool place. This is not only an excellent imitation and substitute for cream syrup, but will keep for a considerable time.

Currant Syrup.—1. Refined sugar, 5 k.; conserve of currents, 2·6 l. Put the sugar in a pan, add the conserve, and heat rapidly. Remove the syrup from the fire as soon as it boils. Skim, and pass through woolen cloth.

2. Six pt. simple syrup, 2 pt. water, 2 oz. tartaric acid, 3 drm fruit essence. Mix; color with liquid carmine for red currants, and with burnt sugar for black.

3. One pt. red currant juice, 1 gal. simple syrup.

4. Proceed as for strawberry syrup.

Framboisé Currant Syrup.—

Raspberry syrup	1	pt.
Currant syrup	4	pt.

Excelsior Syrup.—

Simple syrup	1	pt.
Syrup of wild cherry bark	4	oz.
Port wine	4	oz.

Fancy Syrup.—

Vanilla syrup	2	pt.
Pineapple syrup	8	oz.
Raspberry syrup	8	oz.

Syrup of Figs.—Laxative.

Senna leaves	2	tr. oz.
Buckthorn bark	128	grn.
Jalap	384	grn.
Rhubarb	256	grn.
Cinnamon	30	grn.
Cloves	30	grn.
Nutmeg	15	grn.
Oil peppermint	20	min.
Sugar	12	tr. oz.
Diluted alcohol, enough for	16	fl. oz.

Reduce the drugs to a moderately fine (No. 50) powder, add to it the oil of peppermint and percolate it, in the usual manner, with diluted alcohol. Remove the first 8 fl. oz. of the percolate and dissolve in this the sugar, with the aid of a gentle heat, if necessary, but avoiding loss of alcohol by evaporation. Allow the solution to cool, collect a further portion of percolate and add it to the syrup, so as to make 16 fl. oz.

Fruit Syrups.—These may be prepared either by combining the juice expressed from the fruit with sugar, or the uninjured berries are mixed with the sugar, when the later will extract the juice, leaving the berries shriveled and tasteless. Among the fruit syrups discussed by Mr. Vogeler, syrup of raspberries is the most important. He quotes the following diffierent methods of preparation:

1. Contuse the berries, put them into a suitable vessel or vat, add 2% of sugar, and allow them to ferment at a temperature of 70-80° F. from 3 to 4 days, until the pectin has separated, and no more signs of fermentation are noticeable. Express, let the juice settle for a few days in a cool place, decant and filter. Preserve the juice by Appert's process (introducing the juice into stout bottles, not quite filling them, corking, setting them into a vessel full of cold water, with straw packed between them, so that the water reaches up to the shoulder, and slowly heating the water to boiling; then securing the cork with wax), or convert it into a syrup by dissolving 9 parts of sugar in 5 of the juice, and heating to boiling.

2. A better way is to add at once to the freshly bruised fruit 5 to 6% of alcohol, then proceed as in No. 1.

3. Crush the berries in a glass vessel with a wooden pestle, add 5 to 10% of cane or grape sugar, and allow to stand, stirring occasionally. When fermentation is completed the juice becomes clear. Filter and bottle.

4. Put 4 lb. of the berries into a china bowl with 1 qt. of water containing 2½ oz. of citric acid in solution. Let remain twenty-four hours. Strain, taking care not to bruise the fruit. To one pint of the clear liquid add 1½ lb. of sugar, and stir until it is dissolved.

5. Proceed as in No. 1. When the fermentation is nearly over, express the juice and add to each lb. of it one fl. oz. of deodorized alcohol. Set it aside for one night, filter and bottle, or convert into syrup.

6. Macerate the berries interspersed with layers of sugar, 1¾ lb. to 1 lb. of berries, for twenty-four hours in a cool cellar, and drain off the juice. Preserve by Appert's process

7. Add to the foregoing product some alcohol or a little bisulphite of lime.

8. Pure fruit juice	16	oz.
Dilute acetic acid	1	fl. oz.
Water	7	fl. oz.
Granulated sugar	3	lb.

Dissolve without heat. The acetic acid is considered by the author as objectionable.

Tests for Determining the Purity of Syrup of Raspberries.—Mix equal volumes of the syrup and of 10% ammonia; the color of the genuine syrup changes to a violet with a light tinge of green. If, however, the color changes instantly, or soon, to green or yellow, some foreign vegetable coloring matter is present. If it becomes colorless, or nearly so, it is sophisticated with rosaniline. The latter (or fuchsine) may also be detected by macerating in the syrup

some white wool or silk, and rinsing this afterward with water. Water removes the raspberry stain, but not the aniline color. If the fabrics are dipped into ammonia, the aniline dye will vanish, but will reappear on being moistened with acetic acid.

Ginger Syrup.—1. Take of tincture ginger, 4 oz.; white sugar, 7 lb. (com.); water, ½ gal. Heat the sugar and water until the sugar is dissolved, raise to the boiling point, then gradually add the tincture ginger, stirring briskly after each addition.

2. Six pt. simple syrup, 2 pt. water, 1 oz. tartaric acid, 2 oz. ginger. Burnt sugar to color.

3. Four oz. extract of Jamaica ginger, 1 gal. syrup. Shake well. A few drops of tincture curcuma to color.

4. Nine lb. loaf sugar, 5 lb. water, 12 oz. essence ginger, 4 oz. Rhine wine. Boil sugar and water until dissolved and clear; when cool, add ginger and wine. Mix well and let settle.

Grape Syrup.—1. Half pt. brandy, 1 oz. tincture of lemon, 1 gal. simple syrup, tincture red sanders, 1 qt.

2. Brandy	½	pt.
Spirits of lemon	¼	oz.
Tincture of red sanders	2	oz.
Simple syrup	1	gal.

3. A grape syrup, not an artificial syrup, or one for fountain use, but a syrup from the fruit, for domestic or table use, etc. Take 20 lb. ripe freshly picked and selected tame grapes, put them into a stone jar, and pour over them 6 qt. of boiling soft water; when sufficiently cool to allow it, well squeeze them thoroughly with the hand, after which allow them to stand 3 days on the furnace with a cloth thrown over the jar, then squeeze out the juice and add 10 lb. of crushed sugar; let it remain a week longer in the jar; then take off the scum, strain and bottle, leaving a vent until done fermenting, when strain again and bottle tight, and lay the bottles on the side in a cool place.

Hock and Claret Syrup.—

Hock or claret wine	1	pt.
Simple syrup	2	pt.

Imperial Syrup.—Equal parts of raspberry and orange syrups.

Lemon.—1. Dissolve 6 drm. of tartaric acid and 1 oz. of gum arabic, in pieces, in 1 gal. of simple syrup; then flavor with 1½ fl. drm. of best oil of lemon; or, flavor with the saturated tincture of the peel in cologne spirits.

2. Grate off the yellow rinds of lemons, and beat it up with a sufficient quantity of granulated sugar; express the lemon juice; add to each pt. of juice 1 pt. of water, 3½ lb. granulated sugar, including that rubbed up with the rind; warm until the sugar is dissolved, and strain. Under no circumstances must the syrup be allowed to boil, and the less heat that can be used to effect the complete solution of the sugar the better will be the syrup.

3. Add to 1 gal. simple syrup, when cold, 20 drops fresh oil lemon and ½ oz. citric acid, previously dissolved in 3 oz. water; mix by shaking well in a bottle; add 4 oz. gum solution, made by dissolving 2 oz. of fine white gum arabic in 2 oz. warm water.

4. Six pt. simple syrup, 2 pt. distilled water, 2 oz. essence lemon, 2 oz. citric acid, dissolved in boiling water. Mix, and, if required, color with saffron.

5. Simple syrup	1	gal.
Oil of lemon	25	drops.
Citric acid	10	drm.

Rub the oil of lemon with the acid, add a small portion of syrup, and mix.

Fruit Syrup for Lemonade.—Raspberries, 1,000 grm.; blackberries, 500 grm.; bilberries, 500 grm.; lemon, 3 fruits. Mash in a stone mortar, and add of cold water, 1,500 grm. Let stand for three days, or until fermentation has finished. Express and filter. In every 2,500 grm. dissolve citric acid, 40 grm., and sugar, 4,500 grm. Boil up once in a copper kettle.—*Handb. de Pharm.*

Licorice Syrup.—To 45 parts water add 7½ parts licorice root, cut in pieces. Boil for fifteen minutes. Pour the liquid off and evaporate to 26 parts. Add 30 parts white sugar and 30 parts purified honey. Boil up once.

Manna Syrup.—1. Four parts white sugar, 1 part picked manna. Dissolve in boiling water, and let it boil up.

2. Twelve parts mulberries not quite ripe, 12 parts granulated sugar. Boil, stirring constantly, until the juice shows 30° Baumé. Strain.

Maple Syrup.—

1. Maple sugar	4	lb.
Water	2	pt.

2. Three and one-half lb. maple sugar, 1 qt. water. Dissolve, and, if desired, add a small proportion of gum solution to produce a rich froth.

3. Maple Syrup for Soda Water.—

Maple sugar	10	lb.
Water	5	pt.

Milk Punch Syrup.—

1. Simple syrup	1	pt.
Brandy	8	oz.
Jamaica rum	8	oz.
Cream	1	pt.

2. To 1 pt. heavy syrup add ½ pt. each of brandy and Jamaica rum; flavor with two teaspoonfuls of an extract prepared by macerating 2 oz. of ground nutmegs in 8 oz. of alcohol. The syrup is first to be poured into the glass in the proper quantity and ordinary cream syrup added before drawing the soda water

Syrup of Mulberry.—

1. Mulberry juice	1	pt.
Sugar	2	lb.
Rectified alcohol	2½	fl. oz.

Heat the juice to the boiling point and when it has cooled filter it. Dissolve the sugar in the filtered liquid with a gentle heat and add the spirit.

2. Mulberries, not entirely ripe	6	lb.
Sugar, coarsely powdered	6	lb.

Place in a kettle over the fire and boil, constantly stirring, until the boiling syrup marks 30° B. Throw on a strainer and allow the marc to drain thoroughly.

3. Made from the fruit the same as strawberry, and acidulated slightly with a solution of citric acid. It may also be made from the fruit essence in the same manner as for strawberry, using about half the quantity of tartaric acid.

Nectar Syrup.—1. Take of vanilla syrup, 5 pt.; pineapple syrup, 1 pt.; strawberry or raspberry syrup, 2 pt. Mix.

2. One oz. extract vanilla; 1 oz. extract rose; 1 oz. extract lemon; 1 oz. extract bitter almonds. Mix and add 1 gal. simple syrup; color pink with cochineal.

3. Mix 3 parts vanilla syrup with 1 part each of pineapple and lemon syrups.

Orange Flower Syrup.—

1. Orange flower water	1	pt.
Granulated sugar	28	oz.

Dissolve without heat.

2. Oil of orange	30	drops.
Tartaric acid	4	drm.
Simple syrup	1	gal.

Rub the oil with the acid, and mix.

3. These may be made from the fresh fruit or from the essence in a similar manner as for lemon syrups. Orange syrups may be colored slightly with tincture of saffron or of turmeric.

Syrup Orange Peel, Fresh.—

Fresh orange peel	2	oz.
Alcohol	2	oz.
Aqua pura, q. s. to percolate	9	oz.
Sugar	14	oz.

Cut the peel in small pieces; put in mortar and add the alcohol; thoroughly bruise to a pulp; put in a glass percolator; add the aqua pura until 9 ounces have percolated; put the sugar in percolator, and percolate the menstruum through the sugar until dissolved.—*Pharmacist.*

Orgeat Syrup.—

1. Cream syrup	½	pt.
Simple syrup	½	pt.
Vanilla syrup	1	pt.
Oil bitter almonds	5	drops.

2. Beat to an emulsion in a mortar 8 oz. blanched sweet almonds and 4 oz. bitter ones, adding a little water; when smooth add 3 pts. water; mix and strain; dissolve in this without heat 6 lb. sifted white sugar and 4 oz. fresh orange flower water.

An excellent imitation of orgeat syrup is made by flavoring cream syrup, made with eggs and milk, with a few drops of oil of bitter almonds.

3. Sweet almonds	8	oz.
Bitter almonds	2½	oz.
Sugar	3	lb.
Water	26	oz.
Orange flower water	4	oz.

Blanch the almonds, rub them in a morter to a fine paste with 12 oz. of the sugar and 2 oz. of the water. Mix the paste with the remainder of the water, strain with strong expression, add the remainder of the sugar and dissolve it with the aid of a gentle heat. Lastly, add the orange flower water, and strain the syrup again.

4. Cream syrup	½	pt.
Vanilla syrup	1	pt.
Simple syrup	½	pt.
Oil bitter almonds	5	drops.

Peach Syrup.—Proceed in the same manner as for strawberry syrup.

Pear Syrup.—Proceed with it same as pineapple syrups.

Pineapple Syrup.—1. Proceed as for raspberry, but the hard nature of this fruit requires pounding with a heavy billet of wood (not metal) in a tub with a strong bottom; when well mashed it will require great pressure to extract all the juice from this fruit; a cider press will answer the purpose; add 14 lb. of sugar to a gallon of juice and a little pure acetic acid; put it on a slow fire and stir until the sugar dissolves; when cold, bottle and tie down.

2. Use pineapples of good flavor, cut or chop them up, and set aside from twenty-four to thirty-six hours; press and proceed as directed for strawberry syrup.

3. Take a convenient number of the fruit; pare and mash them in a marble or porcelain mortar, with a small quantity of sugar; express the juice; for each quart of juice take 1½ pt. of water and 6 lb. of sugar; boil the sugar and water, and add the juice; remove from the fire; skim and strain.

4. Oil of pineapple	1	drm.
Tartaric acid	1	drm.
Simple syrup	6	pt.

Raspberry Syrup, Artificial.—

1. Orris root (best)	1	oz.
Cochineal	2	drm.
Tartaric acid	2	drm.
Water	2	pt.

Powder the orris root coarsely together with the cochineal; infuse in the water with the acid for twenty-four hours; strain, add 4 lb. of sugar, raise to the boiling point and strain again.

2. Six pt. simple syrup, 2 pt. water, 2 oz. tartaric acid, 2 oz. essence raspberry. Coloring sufficient. Coloring for raspberry, blackberry, etc., syrups may be made by boiling 1 oz. cochineal with ½ teaspoonful cream of tartar; filter.

3. Take any quantity of fully ripe fruit; free them from stalks; place them in a tub and crush them with a wooden spatula; after they have been mashed, let them remain for three or four hours, and strain the crushed berries through a strong flannel bag, or strainer, *into* a suitable vessel. Dissolve ½ oz citric acid in 3 oz. water, and add this quantity to each gallon of juice; mix 14 lb. broken sugar to every gallon of juice; put on a slow fire and stir until all the sugar is dissolved (not boil); take off the fire, and when cold, bottle and cork for future use. If too thick when cold, it may be brought to a proper consistency by the addition of water.

4. Take fresh berries and inclose them in a coarse bag; press out the juice, and to each quart add 6 lb. white sugar and 1 pt. of water; dissolve, raising it to the boiling point; strain; bottle and cork hot, and keep in a cool place. Raspberry syrup is improved by adding 1 part of currants to 4 parts of raspberries.

5. Five quarts raspberries, 12 lb. white sugar, 1 pt. water. Sprinkle some of the sugar over the fruit in layers, allowing the whole to stand for several hours; express the juice and strain, washing out the pulp with the water; add the remainder of the sugar and water; bring the fluid to the boiling point, and then strain. This will keep for a long time.

6. Imitation.—Three oz. bruised orris root, 2 oz. acetic acid, 1 oz. acetic ether, 1 pt. of alcohol. Cochineal to color. Mix and allow to stand a few days; filter and use to flavor simple syrup.

Rose Syrup.—One gal. simple syrup, 1 oz essence rose. Color pink with prepared cochineal and acidulate lightly with a solution of citric acid.

Sarsaparilla S rup.—1. One gallon simple syrup, 2 oz. essence sarsaparilla. Color with caramel.

2. One gallon simple syrup, essence sarsaparilla, q. s., 1 oz. powdered extract licorice, 15 drops oil of sassafras, 15 drops oil of wintergreen, 10 drops oil of anise seed. Stir the oils with the powdered licorice; add a portion of the syrup; stir smoothly, and mix the whole together by agitation.

3. Oil of wintergreen	10	drops.
Oil of anise	10	drops.
Oil of sassafras	10	drops.
Fluid ext. of sarsaparilla	2	oz.
Simple syrup	5	pt.
Powdered ext. of licorice	½	oz.

4. Parrish's.—		
Simple syrup	4	pt.
Comp. syrup sarsaparilla	4	fl. oz.
Caramel	1½	oz.
Oil of wintergreen	6	drops.
Oil of sassafras	6	drops.

Sherbet Syrup.—

Vanilla syrup	3	pt.
Pineapple syrup	1	pt.
Lemon syrup	1	pt.

Sherry Cobbler Syrup.—To 1 pt. good sherry add an equal measure of heavy simple syrup and one lemon cut in very thin slices. Allow the syrup to stand a few hours; strain through a sieve, and bottle for use.

Simple Syrup.—Take of—

White sugar (com.)	14	lb.
Water	1	gal.

Dissolve with the aid of a gentle heat, strain, and when cold add the whites of two eggs, previously rubbed with a portion of the syrup, and mix thoroughly by agitation. (The egg albumen is added to produce froth.)

Solferino Syrup.—

Brandy	1	pt.
Simple syrup	2	pt.

Syrup of Strawberry.—1. Put 2 parts of strawberries deprived of the calyx, without crushing them, into a large mouthed jar; add to them 2½ parts of sugar, and frequently shake,

keeping the vessel in a cool place. The sugar absorbs the juice, leaving the fruit shriveled and tasteless, the latter being removed by means of a strainer without pressure. Mix the clear syrup with 20% of alcohol. (Source some German journal.) I have made syrups of strawberry and of pineapple in this way for soda water, not adding any alcohol, but I bottled it as soon as made. These syrups were excellent, and I have kept some of them for three years without change, only that a slight sediment would form, which was easily separated. But this syrup will spoil as soon as exposed to the air, except when kept on ice. The above addition of alcohol overcomes this defect

2. Proceed as for raspberry syrup 4; but the fruit, being more stubborn, will require a good beating with the spatula to mash them; when they have stood three or four hours, strain and press the juice out by squeezing the strainer between the hands; add to the juice the same quantity of citric acid; dissolve in each gal. 14 lb. of loaf sugar; simply warm the juice sufficiently to dissolve the sugar; take from the fire, and when cold, bottle and cork till required.

3. Take of—

Fresh ripe strawberries	10	qt.
White sugar	24	lb.
Water	¼	gal.

Spread a portion of the sugar over the fruit, in layers, let it stand four or five hours, express the juice, strain, washing out the marc with water; add remainder of sugar and water, rais to the boiling point and strain.

4. Use strawberries of a good flavor; do not forget that if the berries possess no flavor, you cannot expect to obtain a syrup of fine flavor. Avoid also rotten berries, because unless you do, you may be sure to find as flavor the smell of the rotten berries in your syrup. Mash the fruit in a barrel or other suitable vessel, by means of a pounder, and leave the pulp for twelve or twenty-four hours at a temperature between 70° and 80°; stir occasionally, press, set the juice aside for one night, add for every pound avoirdupois of juice 1 oz. avoirdupois of cologne spirit or deodorized alcohol; mix, set aside for another night and filter through paper.

For 1 lb. of the filtered juice take 1½ lb. of sugar and heat to the boiling point, taking care to remove from the fire or turn off the steam as soon as the mixture begins to boil; remove the scum and bottle in perfectly clean bottles, rinsed with a little cologne spirit.

This syrup, as well as those made by the same process, is strong enough to be mixed with two or three times its weight of simple syrup for the soda fountain.

Syrup of Tolu.—

Tincture of tolu	40	grm.
Powdered gum arabic	40	grm.
Simple syrup	920	grm.

Make a thick mucilage with the gum and a little of the syrup, and incorporate therewith the tincture; then add the rest of the syrup gradually. The gum serves both to suspend the resin in the form of an emulsion and to prevent the syrup from being too thin.

Vanilla Syrup.—

1. White syrup	2	gal.
Citric acid	1	oz.
Extract vanilla	2	fl. oz.

The acid should be dissolved in a small quantity of the syrup before adding to the other ingredients.

2. Fluid extract of vanilla	1	oz.
Simple syrup	3	pt.
Cream (or condensed milk)	1	pt.

May be colored with carmine.

3. Simple syrup	1	gal.
Extract vanilla	1	oz.
Citric acid	½	oz.

Stir the acid with a portion of the syrup; add the extract of vanilla; mix.

4. Simple syrup, 4 pt.; extract of vanilla 2 oz.

Violet Syrup.—1. Refined sugar, 5 k.; fresh violets, tops of the flowers only, 0·525 k.; water, 2,600 l. Bruise the violets in a mortar; put in a water bath with 1·5 l. water at 60° C. Agitate for some minutes and press out the flowers. Put them back in the water bath; add the rest of the boiling water; infuse for twelve hours; allow it to settle; add the sugar, and dissolve by heat.

2. Pick 1 lb. of fresh gathered violet petals, and put them in a jar having a tight fitting cover. Boil 3 lb. of distilled water; pour it boiling over the violets, and let them steep for twelve hours, keeping the jar closed. Strain the whole through a broth napkin, previously rinsed in boiling water, and then dried. Let the infusion rest, and pour it off carefully into a sugar boiler, so that the sediment may not be mixed; add 5 lb. of loaf sugar, broken in pieces, and boil until the syrup registers 30° on the saccharometer. When cold, bottle the syrup, and keep in a cool place. To obtain this syrup of a pleasing color, none but silver or untinned copper stewpans should be used.

Wintergreen Syrup.—

Oil of wintergreen	25	drops.
Simple syrup	5	pt.
Burnt sugar (to color)		q. s.

Tables, Varnish for. See **Varnishes.**

Tallow Candles. See **Candles.**

Tan. See **Cosmetics.**

Tannin or Tannic Acid.—The active constituent of gallnuts, sumac, and the other astringents, is, when pure, a colorless, inodorous body, soluble in water, alcohol, and in ether, which dissolves one-tenth part of its weight. It possesses in a high degree that peculiar taste known as astringent, but is quite free from bitterness. Tannin is found in a great variety of vegetable matters, very few woods and barks being entirely free from it.

Tanning. See also **Mats, Leather, Skins.**—Additional information on tanning is given in the Appendix.—To tan or taw skins with the hair on for rugs and other uses, first thoroughly wash the skin and remove all fleshy matter from the inner surface, then clean the hair or wool with warm water and soft soap, and rinse well. Take ¼ lb. each common salt and ground alum and ½ oz. borax, dissolve in hot water and add sufficient rye meal to make a thick paste, which spread on the flesh side of the skin. Fold it lengthwise, the flesh side in, the skin being quite moist, and let it remain for ten days or two weeks in an airy and shady place, then shake out and remove the paste from the surface and wash and dry. For a heavy skin a second similar application of the salt and alum may be made. Afterward pull and stretch the skin with the hands or over a beam, and work on the flesh side with a blunt knife.

Fur Skins (any kind), to Tan.—After cutting off the useless parts and softening the skins by soaking in warm water, take away the fatty part from the inside, after which soak the skins in tepid water for two hours. Mix equal parts of borax, saltpeter, and Glauber salts (sulphate of soda) in the proportion of about ⅛ oz. of each for each skin, with water q. s. to make a thin paste. Spread with a brush over the inside of the skin, applying more on the thicker parts than on the thinner. Double the skin together, flesh side inward, and place in a cool place. After standing twenty-four hours, wash the skin clean, and apply the following mixture in the same manner as before: 1 oz. sal soda, ⅛ oz. borax, 2 oz. hard white soap, melted slowly together without being allowed to boil; fold together again and put in a warm place twenty-four hours. After this dissolve 3 oz. alum, 7

oz. salt, 1½ oz. saleratus in sufficient hot rain water to saturate the skin; when cool enough not to scald the hands, soak the skin in it for twelve hours; wring out and hang it up to dry. When dry, repeat the soaking and drying two or three times till the skin is sufficiently soft. Lastly, smooth the inside with fine sandpaper and pumice stone.

Skins, to Tan with the Hair On.—1. Stretch the skin tightly and smoothly upon a board, hair side down, and tack it by the edges to its place. Scrape off the loose flesh and fat with a blunt knife, and work in chalk freely, with plenty of hard rubbing. When the chalk begins to powder and fall off, remove the skin from the board, rub in plenty of powdered alum, wrap up closely, and keep it in a dry place for a few days. By this means it will be made pliable, and will retain the hair.

2. Soft water	10	gal.
Wheat bran	½	bushel
Salt	7	lb.
Sulphuric acid	2½	lb.

Dissolve altogether and place the skins in the solution, and allow them to remain 12 hours; then remove and clean them well, and again immerse 12 hours, or longer if necessary. The skins may then be taken out, well washed, and dried. They can be beaten soft if desired.

3. Saltpeter	2	parts.
Alum	1	part.

Mix. Sprinkle uniformly on the flesh side, roll up, and lay in a cool place. Spread it out to dry, scrape off the fat and rub till pliable.

Barkometers.—Guiseppe Tagliabue, of New York, whose large experience entitles him to rank as an authority on the subject, writes:

Barkometers, as at present made, are based upon Baumé's hydrometer scale, the difference being solely that on the barkometer one degree is but one-tenth of one degree Baumé; thus 0 to 60 barkometer scale is 0 to 6 Baumé.

The discrepancy consists in the numerous instruments in the market which are made, price being the only consideration, accuracy and consequence being sacrificed. Let it be stipulated that the barkometer scale be Baumé, graduated as previously stated, viz.: One-tenth of one degree Baumé being one degree barkometer scale, and the Baumé standard being that adopted by the Manufacturing Chemists' Association of the United States, specific gravity 1,835 equaling 66 Baumé; there will then be no discrepancy in the instruments.

Some tanners use Twaddell's hydrometer; the scale of this is converted into specific gravity by multiplying by five and adding 1·000. Thus Twaddell's

$$20\times5+1{\cdot}000=\text{specific gravity, } 1{\cdot}100.$$

In taking hydrometer readings, the correct manner is to read the instrument at the level of the liquid immediately below the upper concave surface formed by the affinity of the liquid for glass, etc. This, in testing opaque liquids, cannot be done; so an allowance or deduction must be made from the apparent indication caused by the liquid ascending the stem of the barkometer. Practice will soon accustom the operator to what allowance should be made for this error in reading. Temperature must of course be accurately observed when using the barkometer, the same as in the use of any hydrometer, but as these are very sensitive instruments, being *graduated to the tenth* of one degree Baumé, the effect of temperature is very apparent. This solution to the question of the barkometer standard, I think, is far preferable to that proposed of taking a number and adopting the mean of the majority, as in this latter case one of those selected being erroneous, the standard would be in error. In this case there would be no scientific base upon which the standard was based. By adopting Baumé as standard, it rests with the manufacturer of the instruments to give proper care to insure uniformity of indications.—*Shoe and Leather Reporter.*

Buckskins, to Tan.—Take a skin, either green or well soaked, and flesh it with a dull knife; spread the skin on a smooth log and grain it by scraping with a sharp instrument; rub nearly dry over the oval end of a board held upright. Take the brains of a deer or a calf, dry by the fire gently, put them into a cloth and boil until soft, cool off the liquid until blood warm, with water sufficient to soak the skin in, and soak until quite soft and pliable, and then wring out as dry as possible; wash in strong soap suds and rub dry and smoke well with wood smoke. Instead of brains, oil or lard may be used, and the skin soaked therein six hours. This is called Indian tan.

Tan Shoes, Dressing for. See **Shoes, Tan,** *Dressing for.*

Saturating Tapes (Madsen).—Stockholm pitch, 8 parts; wax, 2 parts; tallow, 1 part.

Tapeworm, a Rapid Cure for.—A. J. Schalish, of Washington, says that in treating some cases of tapeworm, he employed no preliminary provisions beyond forbidding the patient to take any breakfast the day on which it is intended to remove the worm, and giving him a large dose of Rochelle salts the preceding night. At ten o'clock in the morning he had the following at one dose: Recipe—bark of pomegranate root, ½ oz.; pumpkin seed, ½ drm.; ethereal extract of male fern, 1 drm.; powdered ergot, ½ drm.; powdered gum arabic, 2 drm.; Croton oil, 2 drops. The pomegranate bark and pumpkin seed were thoroughly bruised, and, with the ergot, boiled in 8 oz. of water for fifteen minutes, then strained through a coarse cloth. The Croton oil was first well rubbed up with the acacia and extract of male fern, and then formed into an emulsion with the decoction. In each case the worm was expelled alive and entire within two hours. No unpleasant effects followed. In each case the worm was passed with the head firmly fastened to the side of its body at about the widest part, from which it was with difficulty removed; and the worm was twisted and doubled into various knots.—*The Druggists' Circular.*

Taps, to Harden. See **Hardening.**

Taps, to Temper. See **Tempering.**

Tar, Barbadoes.—A mineral pitch, a bitumen.

Tartar Emetic.—The double tartrate of antimony and potash, or potassio-tartrate of antimony, is much used along with tannin in fixing coal tar colors upon cotton.

Tartar, Essence of.—A name sometimes given to a solution of tartaric acid in water.

Tartar, Liquid (called also protartar spirits), is a mixture of the tartaric and sulphuric acids, diluted with water, and weighted more or less with alkaline salts. It is a clear liquid, colorless or slightly tinted, having an intensely sour taste. It is used by some dyers for leveling a variety of colors, among others, aniline blues upon wool and worsted.

Tattooing, to Remove.—1. The operation is performed by applying nitric acid with the stopper of the bottle (a better instrument would be a glass rod pointed, to carry the acid), just sufficient to cover the stain, so as to avoid making a larger scar than needful, the acid to remain about one and a half minutes, until the *cutis vera* is penetrated and a crusted appearance shown, then washed off with clean cold water. In a few days after this treatment a scab forms, which contains the tattoo mark or stain; remove it, and should inflammation supervene, poultice and bathe with warm water. In this way the skin with the stain is not only removed almost painlessly, but the nitric acid at the same time, to a certain extent, seems to decolorize the stain.

Of course large tattoo marks, greatly extending over the surface, must necessitate the operation being performed differently.

2. Dr. Variot, of the Paris Biological Society, advises the following method: Tattoo the skin, in the usual way, with a concentrated solution of tannin, following the original design. Then apply a crayon of nitrate of silver until the part tattooed with the tannin blackens. Wipe off excess of moisture and allow matters to take their own course. Slight pain continues for two to four days, and after two months the cicatrix which results will almost disappear.—*American Druggist.*

3. These are best removed by the following plan: Wash the part thoroughly with common dilute acetic acid. Half an hour later use—

Caustic potash	4	grn.
Water	1	oz.

After the lapse of another half hour, use—

Dilute hydrochloric acid	1	drm.
Water	1	oz.

This should be repeated daily. Stronger solutions may be used, if they can be borne.

4. It is said that milk pricked under the skin in the same way as the ink was originally applied will change the blue color to red and finally cause it to disappear.

5. A writer in the *Chemical News* has stated that if the tattooing is performed with some carbonaceous matter, the marks can be made to disappear by being first well rubbed with a salve of pure acetic acid and lard, then with a solution of potash, and finally with hydrochloric acid. A dermatologist should be consulted if possible.

Taxidermy, Preparations for. See **Anatomical Preparations.** Also **Soaps,** *Arsenical.*

Tea, Apple.—Roast 8 fine apples in the oven or before the fire; put them in a jug with 2 spoonfuls of sugar, and pour over them 1 qt. of boiling water. Let the whole stand one hour near the fire.

Tea, for Dispensing.—To 2 oz. syrup add 4 oz. compound tea extract and 2 oz. fruit acid solution.

Tea, for Icing.—Cream for icing, 2 pt.; strong tea, 4 oz.; sugar, 1 oz.; yelks of 4 eggs. Mix well and strain, ready for icing.

Tea, Hamburger.—Hamburger tea contains 32 parts of senna leaves, 16 of manna, 8 of coriander, and 1 of tartaric acid, ground up together.

Tea, Solidified.—One hundred grm. of ground sugar and 10 grm. starch sugar are boiled with the quantity of water required for solution, until the mass becomes tenacious, but yet remains transparent. After cooling, 50 grm. of tea previously mixed with 50 grm. of dry sugar, are added. The plastic mass is pressed into moulds, and when solidified forms the preserved tea.

Teeth, The.—These should be well cleaned with a soft brush and powder every morning before breakfast. After dinner or other meal they may have the brush passed lightly round them for a few seconds, and the mouth should be washed out with a weak solution of permanganate of potash or other antiseptic. To scrub the teeth, more especially if the brush be hard, several times daily, is injurious to their structure.

Teeth, Cements for. See **Cements.**—One of the most important points to attend to in filling or stopping teeth is, that each tooth must be thoroughly cleaned out, and wiped perfectly dry, before inserting or applying the cement, of whatever kind it may be. Without careful attention to this matter, the cement will not adhere, or will soon become loose, and drop out or off, and the operation prove a failure. When a defective tooth is conveniently situated, it may often be filled by the party himself, by the exercise of a little skill and care, particularly if it be a hollow one with a clearly defined central cavity. When the reverse is the case, it is generally necessary that the operator should be a second party.—*Cooley's Cosmetic Arts.*

Dentists are more numerous in America than in England, and few would probably care to fill their own teeth. Too much attention cannot be given to the teeth, and the dentist should be consulted and the teeth examined twice yearly.

Odontalgic Drops, Toothache Drops. See also *Odontalgic Elixir* and *Tinctures* below.—As nearly all of them contain highly volatile ingredients, as ether, alcohol, etc., they should be kept in closely stoppered or corked bottles, and the mouth should be closed immediately on their application, and kept so for some time. As many of them contain active ingredients, care should also be taken not to swallow them.

1. Liquor of ammonia (0·8800—0·885) 1 part.
   Ninety per cent. alcohol.....3 or 4 parts.

A little oil of cloves or of cajeput, or of both, is sometimes added. Very effective, if properly applied.

2. Ether 1½ fl.drm.
   Alcohol 1½ fl.drm.
   Camphor 1 drm.

Dissolve, and add, of—

Liquor of ammonia (0·8800- 0·885) ½ fl.drm.

Very serviceable.

3. Creosote 1 drm.
   Ninety per cent. alcohol 1 drm.
   Oil of cloves ½ fl.drm.

Excellent for rotten or decayed teeth.

4. Dr. Blake's.—

Alum (in fine powder)	1	drm.
Sweet spirits of niter	1	fl. oz.

Agitate them together occasionally for an hour. A bad chemical mixture, of little value, since the alum is nearly insoluble in the intended menstruum. Sweet spirits of niter is a name for an alcoholic solution of nitrous ether.

5. Boerhaave's Odontalgic.—

Opium	½ [troy. drm. [avdps.	
Camphor (powdered)	4 or 5	drm.
Oil of cloves	2	fl.drm.
Ninety per cent. alcohol (strongest)	1½	fl. oz.

Agitate the mixture occasionally for a week, and, after repose, pour off the clear portion. Often serviceable, and much esteemed by some persons, as toothache drops.

6. Dr. Copland's.—

Powdered opium	10	grn.
Camphor	10	grn.
Oil of cloves	1	drm.
Oil of cajeput	1	drm.
Ninety per cent. alcohol (strongest)	½	fl. oz.
Ether	½	fl. oz.

Mix, and agitate the bottle occasionally for a day or two, as the last.

7. Cottereau's.—A nearly saturated ethereal solution of camphor, to which as much of the strongest liquor of ammonia is added as can be without clouding the liquid. If the latter occurs, the addition of a few drops of alcohol will restore it. A useful remedy.

8. Rigbini's.—

Creosote	5	drm.
Rectified spirit	5	fl.drm.
Tincture of cochineal (strong)	2	fl.drm.
Oil of peppermint (English)	½	drm.

Mix. Resembles No. 3.

9. American Toothache Drops.—Made by Majewsky in Warsaw, have different compositions. Those which took the prize at Vienna consisted of common salt and brandy colored with harmless cochineal red.

10. Hydroclorate of morphia.....30 grn.
Concentrated tincture of pellitory (made with 90% alcohol).. 2½ fl. oz.
Oil of cloves..... ½ fl. oz.
Chloroform..... ½ fl. oz.

Agitate them together until mixed. Used as toothache drops, observing to shake the bottle well before use, and to keep it closely corked or stopped and in a cool place. An excellent remedy.

Pastes for the Toothache, Odontalgic Pastes, Pastæ Odontalgicæ, Pâtes Odontalgiques.—

1. Root bark of pellitory..... 1 drm.
Hydrochlorate of morphia..... 5 grn.

Triturate until reduced to fine powder, then add, of—

Honey, finest, thick..... 3 drm.
Oil of cloves or of cajeput.....20 drops.
Concentrated tincture of pellitory..... q. s.

Form the whole into a smooth paste. Very effective.

2. Pellitory root, in fine powder... 1 part.
Mastic, in fine powder..... 1 part.
White sugar, in fine powder..... 1 part.
Chloroform..... q. s.

Make them into a paste, and at once put it in a stoppered bottle. It must be kept in a cool place.

3. De Handel's.—

Powdered opium..... ½ drm.
Camphor, powdered..... 1 drm.
Extract of belladonna..... 1 drm.
Extract of henbane..... 1 drm.
Oil of cajeput..... 15 drops.
Tincture of cantharides.....15 drops.

Mix, adding distilled lettuce water, q. s. to form a paste.

4. Rust's.—

Powdered opium .....10 grn.
Extract of henbane.....10 grn.
Powdered pellitory root .....20 grn.
Extract of belladonna .....20 grn.
Oil of cloves .....15 drops.

Mix thoroughly.

5. Turton's.—

Pellitory root, powdered..... 1 drm.
Lump sugar, powdered..... 1 drm.
Camphor, powdered .....30 grn.
Concentrated tincture of pellitory..... q. s.

To form a paste.

6. Vohler's.—

Dragon's blood, powdered..... 1 drm.
Opium, powdered..... 2 drm.
Gum mastic, powdered..... 4 drm.
Gum sandarac, powdered ..... 4 drm.
Oil of rosemary .....25 drops.
Tincture of opium ..... q. s.

To form a paste.

A small quantity of one of the preceding is inserted in the hollow of the aching tooth, or placed against the corresponding gum. They must on no account be swallowed

7. Myrrhine Tooth Paste.—This favorite Parisian specialty is said by the *Pharm. Era* to consist of—

Precipitated chalk..... .....54 parts.
Arrowroot ..... 5 parts.
Powdered myrrh ..... 7 parts.
Cinnamon..... 1 part.

Sufficient glycerine to make a paste. A mixture 1 part glycerine and 2 parts chloroform water is better than glycerine alone.

8. Take sugar of milk, 100 parts; pure tannin, 15 parts; lake, 10 parts; oils of mint, aniseed and orange flowers, sufficient quantity. Rub together the lake and tannin, gradually add the sugar of milk, and then the oils (Recommended.)

Tooth Pastes for Cleansing the Teeth. See also *Tooth Powders* below.—

1. Carbon Tooth Paste, Dentifrice Carbonique, Opiat Carbonique, etc.—

Chippings of Turkey stone (in very fine powder)..... 2 oz.
Cylinder charcoal (in very fine powder)..... 2 oz.
Prepared chalk..... 2 oz.
Cochineal..... 1½ drm.
Cloves..... 1½ drm.
Honey..... 5 oz.
Eau de Cologne..... q. s.

Mix as before. In some samples powdered pumice stone replaces the Turkey stone. Much prized by smokers and persons with rotten teeth and foul breath; but is not fit for very frequent use.

2. Winckler's Roseate Dentifrice or Tooth Paste.—

Cuttle fish bone..... 1 part.
Conserve of roses (red)..... 3 parts.
Otto of roses (per ounce) ..... 2 or 3 drops.

Mix as before. The otto is dissolved in a little rectified spirit before adding it to the paste, or else rubbed up with the dry cuttle fish bone. Cleans and whitens the teeth rapidly.

3. Violet Tooth Paste.

Prepared cha ..... 3 oz.
Cuttle fish bone (powdered)..... 2 oz.
White sugar powdered) ..... 2 oz.
Orris root (powdered)..... 1 oz.
Smalts ..... 2 to 3 drm.
Syrup of violets (to mix)..... q. s.

A fashionable tooth paste, highly esteemed for its power of cleaning the teeth and its delicate color and odor.

4. Ward's Tooth Paste, Zieter's Antiscorbutic Dentifrice.—

Prepared chalk ..... 2 oz.
Myrrh ..... ½ oz.
Rhatany root ..... ½ oz.
Cuttle fish bone..... ½ oz.
Orris root..... ¼ oz.
Honey..... 3 oz. or q. s.

A very useful dentifrice in foul, spongy, and scorbutic gums, loose and rotten teeth, etc.

5. Take of—

Burnt hartshorn (or prepared chalk)..... 3 oz.
Cuttle fish bone..... 2 oz.
Orris root..... 1½ oz.
Armenian bole (or rose pink).... 1½ oz.
Oil of cloves, or essence of ambergris or musk..... 15 to 20 drops.

6. Magic Tooth Paste.—

White marble dust..... 2 oz.
Pumice stone (in impalpable powder)..... 1½ oz.
Rose pink..... ½ oz.
Honey..... 4 oz.
Otto of roses..... 7 or 8 drops.

Mix as before. A favorite nostrum for rapidly cleaning and whitening the teeth, but one not adapted for free or frequent use.

7. Soap Tooth Paste, Spanish Dentifrice.—

Castile soap (air dried, in fine powder) ..... 2 oz.
Cuttle fish bone..... 2 oz.
Narbonne honey..... 4 or 5 oz.
Aromatics or perfume (at will).. q. s.

with or without the addition of a little 90% alcohol.

A very excellent preparation, superior to all the other pastes for cleaning the teeth and removing tartar and animalcules from them.

Tooth Powders.—See also *Pastes for Cleaning* above. These formulæ are of many years, standing. The following receipts are particularly recommended, as they come from a reliable authority:

1. Piesse & Lubin's Tooth Powder.—

Precipitated chalk	1	lb.
Orris powder	1	lb.
Carmine	½	drm.
Powdered sugar	¼	lb.
Otto of roses and neroli, each	1	drm.

2. Opiate Tooth Powder.—

Honey	½	lb.
Precipitated chalk	½	lb.
Orris powder	½	lb.
Tincture of opium and myrrh, ea.	¼	oz.
Essence of cloves	½	drm.
Essence of nutmeg	½	drm.
Essence of rose	½	drm.

3. Cuttle fish powder 8 oz.
Rock alum 1 oz.
Cream of tartar 2 oz.
Orris root 1 oz.
Burnt hartshorn 2 oz.
Oil of rhodeum 6 drops.

4. Charcoal of the areca nut.

5. Prepared chalk 2 oz.
Cuttle fish 1 oz.
Orris root 1 oz.
Myrrh ½ oz.
Sulphate of quinine 10 grn.

6. Orris root 4 oz.
Cuttle fish 2 oz.
Cream of tartar 1 oz.
Myrrh ½ oz.
Oil of cloves 16 min.

7. Peruvian bark 1 oz.
Cream of tartar 2 drm.
Myrrh 1 drm.
Cuttle fish 4 drm.
Oil of cloves 8 drops.

8. Cuttle fish 8 oz.
Cream of tartar 4 oz.
Orris root 2 oz.

9. Anadoli.—Tooth Powder by Kreller, Nuremburg.—

Soap, powdered	42	parts.
Starch powder	44	parts.
Levantine soapwort	12	parts.

Oil of bergamot and lemon to color.

Tooth Powders, Dentifrices, Poudres pour les Dents, etc.—The general principles which should be kept in view in the selection of the materials, and in the preparation of tooth powders, as well as the best method of using them, ought to be very well understood. It may, however, be useful to repeat here that great care should be taken to finely pulverize all the dry ingredients, and to reduce the harder and gritty ones to the state of impalpable powder, either by patient levigation or trituration or by elutriation. To insure the perfect mixture of the ingredients, they should be stirred together until they form an apparently homogeneous powder, which should then be passed or rubbed through a fine gauze sieve. Those which contain volatile or perishable substances or which, like charcoal, are affected by contact with the air, should be put up in dumpy, wide mouthed bottles and kept closely corked.

1. Prepared chalk mixed with ⅛ its weight to an equal weight of cuttle fish bone and aromatized, or not, with 8 or 10 drops of oil of cloves, or with 5 or 6 drops each of the oils of cloves and cassia, or with 1 drm. of orris root per oz. A simple and really excellent tooth powder for frequent use.

2. Prepared chalk, burnt hartshorn and cuttle fish bone, equal parts, scented as before. Acts rather more rapidly than the preceding.

3. Burnt hartshorn mixed with half its weight of cuttle fish bone, as before. Resembles the last in quality, but preferred to it by some persons.

4. Prepared chalk mixed with ⅛ to ¼ its weight of pumice stone in impalpable powder, as before. Acts more rapidly than the preceding, but is less fitted for frequent use.

5. To any one of the preceding add about ⅛ to ½ its weight of powdered Castile soap. Rapidly whitens the teeth and removes tartar. The preceding, with this addition, are highly esteemed in fashionable life.

6. As the last, but using hydrate of alumina instead of soap. Recommended by M. Bonnamy for its power of rapidly whitening and deodorizing the teeth. It is perfectly harmless.

7. Prepared chalk 4 oz.
Cuttle fish bone 3 oz.
Orris root 2 oz.
Dragon's blood 1 oz.
Oil or essence (as last) ½ drm.

Mix; 1 or 2 oz. of red bole or rose pink are often added.

Aromatic Tooth Powder.—This name is commonly given to any powder strongly aromatized with cassia, cloves, and the like. The following is the composition of three samples from West end houses:

1. Cuttle fish bone 4 oz.
Red bole 2 oz.
Calamus aromaticus 1½ oz.
Bicarbonate of soda 2 drm.
Cassia 1½ drm.
Cloves 1½ drm.
Musk seed 1½ drm.
Yellow sandal wood ½ drm.

2. Prepared chalk 2 oz.
Bone ash 2 oz.
Pumice stone 1½ oz.
Red bole 1½ oz.
Cardamom seeds ¼ oz.
Cloves ¼ oz.
Cassia ¼ oz.
Orris root ¼ oz.
Oil of orange peel 15 drops.
Essence royale 15 drops.

3. Cuttle fish bone 2 oz.
Powdered oyster shells 2 oz.
Pumice stone 2 oz.
Rose pink 2 oz.
Dragon's blood 1 oz.
Cloves ½ oz.
Cassia ½ oz.
Oil of rhodium 12 drops.
Essence royale 12 drops.

Some samples of similar composition contained ¼ to ½ part of powdered soap.

4. Asiatic Dentifrice.—

Red cordal	5	oz.
Prepared oyster shells	5	oz.
Pumice stone	3	oz.
Venetian red	3	oz.
Oil of cloves	½	fl.drm.
Oil of cassia	½	fl.drm.
Essence of vanilla	½	fl.drm.
Essence of musk	½	fl.drm.

5. Sozodont (Liquid).—Take of potassium carbonate, ½ oz.; honey, 4 oz.; alcohol, 2 oz.; water, 10 oz.; oil wintergreen and oil rose, sufficient to flavor. This is a liquid wash, and is inserted here as it could be more readily found.

6. Camphorated Chalk.—Precipitated chalk, 1 lb.; powdered orris root, ½ lb.; powdered camphor, ¼ lb. Reduce the camphor to powder by rubbing it in a mortar with a little spirit; then sift the whole well together.

7. Coral Tooth Powder, Coral Dentifrice.—

Red coral	3	oz.
Red bole	3	oz.
Cuttle fish bone	3	oz.
Dragon's blood	1½	oz.
Cinnamon	¾	oz.
Cochineal	3	drm.
Cloves	1	drm.
Cream of tartar	4½	oz.

8. Impalpably pulverized charcoal. 1 oz.
Sugar. 1 oz.
Volatile oil of cloves. 3 drops.

Make into a homogeneous powder under a muller.

9. Impalpably pulverized charcoal. 1 oz.
Red bark. 1 oz.
Pulverized sugar. 4 drm.
Volatile oil of mint. 4 drops.

10. Impalpably pulverized charcoal. 1 oz.
Sulphate of quinine. 2 grn.
Magnesia. 2 grn.

Perfume with some drops of rose water or essence of mint, cinnamon, or with powdered rose leaves, or orris root.

11. Farina Tooth Powder (Piesse).—

Burnt horn	2	lb.
Orris root	2	lb.
Carmine	1	drm.
Very fine powdered sugar	½	lb.
Otto of neroli	½	drm.
Otto of lemons	¼	oz.
Otto of bergamot	¼	oz.
Otto of orange peel	¼	oz.
Otto of rosemary	1	drm.

12. Magic Tooth Powder.—The so-called magic tooth paste consists of very fine white marble dust, 2 oz.; pumice stone in impalpable powder, 1½ oz.; rose pink, ½ oz.; otto of roses, 7 or 8 drops. Mix with sufficient honey to make a paste. This will rapidly clean the teeth, but it is not adapted for free or frequent use.

13. Pâte Mineral, by M. Berteaux de Chaillevoix, Paris.

Absolute alcohol	7	drm.
Sulphuric acid	3	drm.
Ammoniæ aqua	4	scr.

Mix with finely powdered asbestos, to a consistence equaling a common honey paste. Put up in ground stoppered bottles.

14. Odontine.—There are several dentrifices advertised under this name, two or three of which have acquired a very large sale in the fashionable world. That of a certain eminent West end perfumery house appears to have the following composition:

Cuttle fish bone	1	part.
Castile soap	1	part.
Red coral	1	part.
Tincture of cochineal (to color)	q. s.	
Honey (to mix)	q. s.	
Essential oil (to aromatize)	q. s.	

15. Pearl Dentrifice, Pearl Tooth Powder.—

White marble dust	4	oz.
Cattle fish bone	1	oz.
Smalts (finest)	1	drm.
Essence de petit grain	10 to 12	drops.

Mix. A favorite with ladies who have white, healthy teeth. Precipitated chalk or heavy carbonate of magnesia is commonly substituted for the marble dust, but the quality of the product suffers in all but color.

16. Peruvian Bark Tooth Powder.—Peruvian bark in powder, ½ lb.; bole armeniac, 1 lb.; orris powder, 1 lb.; cassia bark, ½ lb.; powdered myrrh, ½ lb.; precipitated chalk, ½ lb.; otto of cloves, ¼ oz.

17. Quinine Tooth Powder.—Precipitated chalk, 1 lb.; starch powder, ½ lb.; orris powder, ½ lb.; sulphate of quinine, 1 drm. Sift.

18. Rose Tooth Powder.—Precipitated chalk, 1 lb.; orris powder, ½ lb.; rose pink, 2 drm.; otto of rose, 1 drm.; otto of santal, ¼ drm.

19. Myrrh Dentifrice.—

Cuttle fish bone	6	oz.
Burnt hartshorn	2	oz.
Myrrh	2	oz.
Orris root	2	oz.

Mix. A good powder, often serviceable in foul gums, loose teeth, etc.

20. Violet Tooth Powder.—

Precipitated chalk	6	oz.
Cuttle fish bone	3	oz.
Rose pink (bright)	½	oz.
Orris root	1½	oz.
Essence of violets (orris)	½	fl.drm.
Indigo (pure, to strike a violet tint)	q. s.	

Odontalgic Elixirs, Tooth Elixirs.—These, when employed to relieve toothache, are applied like the drops previously noticed. When used to medicate the gums, they are commonly applied with the tip of the finger, or the brush, either alone, or diluted with an equal bulk, or twice or thrice their bulk, of water. When intended to correct or disguise foulness of the breath, or to perfume it, they are either applied in the way last mentioned or are diluted with 6 or 8 times their bulk of water, the mixture being then used as a rinse or wash for the teeth and mouth. The following are chiefly nostrums of the first class referred to:

1. Cinnamon. 1½ drm.
Cloves. 1½ drm.
Nutmeg (grated). 1½ drm.
Vanilla. ½ drm.
Camphor. 15 grn.
Lump sugar (hard, dry). 1½ oz.

Pound and rub them together in a mortar until reduced to powder; put this into a bottle; add of—

Tincture of pellitory	2	fl. oz.
Proof spirit, or French brandy (strongest)	½	pt.

Digest, with agitation, for 8 or 10 days, and, after repose, decant or filter. For toothache, foul breath, sore and scorbutic gums, etc.

2. Desforge's.—

Gum guaiacum (in coarse powder)	2½	oz.
Cinchona bark (bruised)	1½	oz.
Pellitory root (bruised)	1½	oz.
Cloves	¼	oz.
Yellow rind of oranges	1	drm.
Gum benzoin	1	drm.
Hay saffron	1	drm.
Rectified spirit	½	pt.
French brandy	¼	pt.

Mix, etc., as the last. Uses, the same.

3. Lefandinière's Elixir for the Teeth and Gums.—

Guaiacum raspings	¼	oz.
Cloves	¼	oz.
Pellitory root (bruised)	1	drm.
Nutmegs (grated)	½	drm.
Oil of rosemary	6 or 7	drops.
Oil of bergamot	6 or 7	drops.
Brandy	½	pt.

Digest for a week, with agitation, and then decant or filter. In toothache, scorbutic gums, fetid breath, etc.

4. Elixir of Roses.—

Eau de rose	2	fl. oz.
Spirit of horseradish	1	oz.
Spirit of scurvy grass	1	oz.
Camphor (powdered)	12	grn.
Cochineal (powdered)	12	grn.
Otto of roses	3 or 4	drops.
Sugar candy (powdered)	½	oz.

Digest for a week, decant, and strain through muslin. In scurvy of the gums, and to perfume the breath.

5. Vining's Tooth Elixir.—

Cinnamon (crushed)	¾ oz.
Unbleached Jamaica ginger (grated)	½ oz.
Cloves	1 drm.
Hay saffron	1 drm.
Oil of peppermint	½ drm.
Oil of orange peel	½ drm.
Otto of roses	10 drops.
Rectified alcohol	½ pt.

Digest fifteen days, as before. For toothache, foul breath, etc.

Odontalgic Tinctures, Toothache Tinctures, Tincturæ Odontalgicæ.—These are applied in the same way as the toothache drops previously noticed. They are also often called essences, etc. The following are a few examples:

1. Tincture of Pellitory.—

Pellitory root (bruised)	1 oz.
Rectified spirit	¼ pt.

Digest a week, with frequent agitation, then express the tincture, and after repose, decant or filter it.

2. Ethereo-alcoholic Tincture of Pellitory.—

Pellitory (bruised)	1 oz.
Ether (pure)	2 fl. oz.
Ninety per cent. alcohol	3 fl. oz.

Digest them together, in a stoppered bottle in a cool place, as before, but avoid filtration. Some persons use equal parts of ether and 90% alcohol, but the product does not keep so well. An excellent remedy for toothache and faceache, more active than the preceding often giving almost immediate relief in the former. Two similar tinctures are in the Paris Codex. The addition of a little oil of cloves or of cajeput is sometimes made to them.

3. Ethereal Tincture of Pellitory.—

Pellitory (bruised)	1 oz,
Ether (pure)	8½ flu. oz.

And proceed as before. Very active, but not so convenient as the last, from its extreme volatility. It must be kept in a well stoppered bottle and in a cool place.

4. Compound Tincture of Pellitory.—

Pellitory (bruised)	4 drm.
Camphor	3 drm.
Oil of cloves	2 drm.
Opium (powdered)	1 drm.
Ninety per cent. alcohol	6 fl. oz.

Digest for eight days. This is nearly similar to Prof. Brande's formula given below. The product is a most serviceable form of toothache drops.

5. Tincture of opium 2 fl.drm.
Ether 4 fl.drm.
Oil of cloves ½ fl.drm.

Mix, with agitation, and shake it each time before use. The product is a favorite form of toothache drops with many persons, and represents the composition of several odontalgic nostrums.

6. Creosote 1 drm.
Chloroform 2 drm.
Ninety per cent. alcohol 3 fl.drm.

Mix, etc., as the last. Very serviceable in toothache arising from caries.

7. Brande's Tooth Tincture, Brande's Odontalgic Essence.—

	Troy.
Pellitory of Spain (bruised)	1 oz.
Camphor	¾ oz.
Opium	¼ oz.
	Avoir.
Oil of cloves	2 fl.drm.
Ninety per cent. alcohol	½ pt.

Digest, with agitation, for ten days, then decant the clear portion, express and filter the rest and mix the two together.—*Vide No.* 4.

8. Horn's Liton, infallible cure for toothache, contains 5 parts of phosphate of lithia dissolved in 400 parts of alcohol.

Tooth Washes, Liquid Dentifrices, etc.—1. Hudson's Tooth Tincture.—A mixture of about equal parts of tincture of myrrh, tincture of cinchona, cinnamon water, and eau d'arquebusade (or other like aromatic spirit), to which a little sugar and mucilage are added. As the last; also to fix the teeth.

2. Ruspini's Tooth Tincture.—

Orris root, in coarse powder	2 oz.
Cloves, in coarse powder	¼ oz.
Ambergris	5 gr.
Ninety per cent. alcohol	½ pt.

Digest, with agitation, for a fortnight. Used as the above; and, particularly, to sweeten the breath. It has long been a popular and fashionable dentifrice, etc.

3. Mouth Wash, Camphorated Eau de Cologne.—

Eau de Cologne	1 qt.
Camphor	5 oz.

Lotion of Myrrh, Dr. Kirkland's Lotion.—

1. Tincture of myrrh 1 oz.
Water 2 oz.
Mucilage ½ oz.

Agitate them well together, and again each time before use. As a wash in rotten and loose teeth, foul, spongy and ulcerated gums, fetid breath, etc. It is often very serviceable where there is a scorbutic taint.

2. Dr. Kirkland.—

Tincture of myrrh	1 part.
Lime water	1 part.

Used as the last.

3. Compound. Take of—

Tincture of myrrh	½ fl. oz.
Honey of roses	½ fl. oz.
Lime water	¼ pt.

Used as No. 1.

4. Tannin (tannic acid) ½ drm.
Tincture of tolu 2 fl.drm.
Tincture of myrrh 6 fl.drm.
Spirit of horseradish 2 fl. oz.

Agitate them together until solution be complete. Useful in loose teeth, foul and spongy gums, etc., particularly of a scorbutic kind.

Emulsion or Milk of Myrrh, Myrrh Mixture, Myrrh Water.—

1. Myrrh ¼ oz.

Powder it, add of—

Mucilage, thick 2 fl.drm.

Triturate to a perfectly smooth paste, and, triturating all the time, add gradually, of—

Water, warm ½ pt.

Agitate the whole till cold, and then strain the liquid through muslin.

2. Myrrh 2 drm.
Sal ammoniac 1 drm.
Water, cold ½ pt.

As the last.

3. Tincture of myrrh 1½ fl. oz.
Mucilage, thick ½ oz.
Water, cold 8 oz.

Mix by agitation. A fashionable and useful dentifrice and wash in foul and rotten teeth, spongy and ulcerated gums, etc.

Eau Odontalgique of Dr. O'Meara, Paris.—

Vitivert of India	1 drm.
Pyrethrum root	½ oz.
Cloves	6 grn.
Orris root	12 grn.
Coriander	12 grn.
Alkanet	12 grn.
Essence of mint (English)	12 drops
Essence of bergamot	6 drops
Alcohol 36°	2 oz.

Bruise the solid materials in a mortar and place them, together with the alcohol and essences, in a tightly covered vessel. Macerate for eight or ten days, stirring frequently during the interval, and at the end of that time decant and filter the liquor.

Tooth Wash, Soap.—1. Camphor, ½ oz.; tincture of myrrh, 2 oz.; tincture of Peru balsam, 2 oz.; rectified spirit, 1 pt.; oil of spearmint, 10 drops.

2. Tooth Soap.—Precipitated chalk, 1 lb.; powdered orris, ¼ lb.; powdered myrrh, 2 oz.; powdered white soap, 3 oz; powdered saffron, 1 oz.; oil of lavender, 2 drm.

3. Air dried Castile soap, in powder, 2 oz.; cuttle fish, in powder, 2 oz.; honey, 4 or 5 oz.; aromatics and perfumes to suit.

Liquid Dentifrice. Odontine.—Dr. Fr. Hoffman's—

Quillaia	4	oz.
Cudbear	1	drm.
Alcohol, 50%	32	fl. oz.

Digest together in a closed vessel for several days and filter. To the filtrate, measuring 32 fl. oz., add—

Heliotropin	2	gr.
Oil of peppermint	20	gtt.
Oil of anise	10	gtt.
Alcohol	1	fl. oz.

Allow to stand in a warm place for several days, filter if necessary, and complete by adding—

Glycerine	2	fl. oz.

Sozodont.—The reddish liquid consists of a solution of 5 grm. oil soap in 6 grm. glycerine, 30 grm. spirits, 20 grm. water, perfumed with a few drops of oil of peppermint, oil of cloves, oil of cinnamon and oil of anise, and colored with cochineal. The powder is a mixture of carbonate of lime, magnesia and Florentine orris root. None of the ingredients can be considered objectionable.

Vegetable Tonic Tooth Wash.—

1. Soap bark, ground	2	lb.
Water	1	gal.
Add honey	4	oz.

Simmer in warm water several hours; let it stand overnight; strain through muslin. To the fluid product add an equal amount of alcohol in which has been dissolved—

Gum myrrh	1	oz.
Oil tea berry	1	oz.

Color with red sanders, digest one week and filter. This is about the best tooth wash that can be made.

2. For diseased and inflamed gums, 2 parts of golden seal, 1 part of powdered burnt alum, and 2 parts of glycerine, made into a paste and rubbed on the gums and around the teeth at night, strengthens and restores the gums to health, provided no tartar is present to cause the disease, which must be removed first before applying.

Tooth Washes.—1. Dissolve 2 oz. of borax in 3 pt. water; before quite cold add thereto 1 teaspoonful of tincture of myrrh and 1 tablespoonful of spirits of camphor; bottle for use. One wineglassful of the solution, added to ½ pt. of tepid water, is sufficient for each application. This solution, applied daily, preserves and beautifies the teeth, extirpates tartarous adhesion, produces a pearl like whiteness, arrests decay, and induces a healthy action to the gums.

2. Take of—

Soap tree bark, in powder	2	oz.
Orris root, in powder	1	oz.
Canada snake root, in powder	½	oz.
Cloves, in powder	½	oz.
Alcohol	10	fl. oz.
Water	5	fl. oz.
Honey	2	oz.

Mix the alcohol and water and exhaust the powders by the process of percolation; add the honey to the percolate, and filter through paper.

3. Eau de Botat (dentifrice).—

Anise	1	oz.
Cloves	2	drm.
Cinnamon	2	drm.
Oil of mint	1	scr.
Brandy	1¾	lb.
Tincture of amber	1	drm.

After six days' infusion, filter.

4. Carbolized Tooth Wash.—

Water	1,000	parts.
Essence of meat	2	parts.
Tincture of saponine	50	parts.
Pure carbolic acid	10	parts.

Mix. A dessertspoonful in a quarter of a tumblerful of water serves as an excellent preparation for cleansing and preserving the teeth.

Eau de Cologne Dentifrice.—This may be made with tincture of quillaia (1 in 5). Thus—

Salicylic acid	2	drm.
Tincture of quillaia	2	oz.
Eau de Cologne	3	oz.
Glycerine	1	oz.
Orange flower water	7	oz.
Distilled water	7	oz.

Mix, shake up with powdered pumice until clear, and filter.

Foaming Tooth Wash.—The following formula was given in *The Chemist and Druggist Diary*, 1884:

Quillaia bark, in coarse powder	4	oz.
Glycerine	3	oz.
Rectified spirit	5	oz.
Water	30	oz.

Macerate for seven days and filter through 2 drm. of magnes. carb. with which have been mixed oil of wintergreen, 20 drops, and oils of neroli and cloves, 4 drops each. Finally add 1 drm. each of benzoic acid and tincture of pellitory; color with cochineal or saffron.

Teeth, Soap for. See **Soaps.**

Temperature, Effects of.—

	Deg. F.
Cast iron melts, Morveau, at	8696
Gold melts 2200 Kane, Morveau	2518
Copper melts 1996 Kane, Daniell	2548
Silver melts, Daniell	2233
Brass melts, Daniell	1869
Iron, bright cherry red, Poillett	1000
Red heat visible in daylight, Daniell	980
Zinc begins to burn, Daniell	941
Zinc melts 793 Gmelin, Daniell	648
Mercury boils 644 Daniell, Graham	662
Whale oil boils, Graham	630
Pure lead melts 612 Parkes, Daniell	609
Linseed oil boils	600
Sulphuric acid boils 545 Phillips. Graham	620
Bismuth melts 518 Gmelin, Philips	476
Tin melts	442
Arsenious acid volatilizes	380
Metallic arsenic sublimes	356
Oil of turpentine boils, Kane	315
Etherification ends	302
Sat. sol. of acetate of soda boils	256
Sat. sol. sal ammoniac boils, Taylor	257
Sat. sol. nitric acid 1·42 boils, and sol. soda 1·44	248
Sat. sol. niter boils	238
Sulphur melts 232 Turner, Fownes	226
Sat. sol. of salt boils, Paris Codex	221
Sat. sol. of alum, carb. soda, and sulph. zinc, boil.	220
Sat. sol. of chlorate and prussiate of potash boil	218
Sat. sol. of sulph. of iron, sulph. of copper, nitrate of lead, boil	216
Sat. sol. of acetate of lead, sulph. and bitartrate of potash, boil.	214
Water begins to boil in glass, 213·5 or	213

	Deg. F.
Water boils in metal, barometer at 30°	212
Alloy of 5 bismuth, 3 tin, 2 lead, melts	211
Alloy of 8 bismuth, 5 lead, 3 tin; melts, Kane	201
Sodium begins to melt	194
Nitric acid 1·52 boils	185
Starch dissolves in water	180
Rectified spirit boils, benzole distills	176
Alcohol, sp. gr. 0·796 to 0·800, boils	173
Beeswax melts 151 Kane, Lepage	142
Pyroxylic spirit boils, Scanlan	150
Chloroform, and ammonia, of 0·945, boil	140
Potassium melts, Daniell	136
Acetone, pyroacetic spirit, boils, Kane	132
Mutton suet and styracine melt	122
Bisulphide of carbon boils, Graham	116
Pure tallow melts 115 Lepage, Thomson	92
Spermaceti and stearine of lard melt	112
Phosphorus melts	99
Ether, 0.720 boils. Temperature of the blood	98
Acetous fermentation ceases, water boils in vacuo	88
Vinous fermentation ends, acetous fermentation begins	77
Oil of anise liquefies, congeals at 60	62
Gay Lussac's alcoholometer graduated at	59
Syrups to be kept at	55
Sulphuric acid, sp. gr. 1·741, congeals at or	42
Olive oil freezes	36
Water freezes	32
Milk freezes	30
Vinegar freezes	28
Wine freezes	20
Cold produced by snow and salt	0
Brandy freezes	7
Mercury freezes	39·40

See also **Thermometer.**

Tempering. See also **Hardening** and **Casehardening.**

Axes, Tempering of.—The poll should be heated in a charcoal fire until it is little more than a cherry red. Then change ends and heat the bit to a cherry red. Cool the bit only in cold salt water. Immerse in the water at once, otherwise there may be a fire crack in it that will spoil it.

Scour with brick; put the poll in the fire endways. The temper should run to a blue. Do not use a blast.

Burglar and Drill Proof Diamond Chill.—Take 1 gal. urine and add to it 1 oz. borax and 1 oz. salt.

Cold Chisels, Tempering.—Heat the chisel at a low heat, so as not to raise a scale. Dip in a brine of clear salt and water. About 1 qt. of salt to 10 qt. of water is the right proportion. Leave heat enough in the tool to run the temper down to a required hardness, which is shown by the pigeon blue color. Take care to make the chisel stout enough that it won't spring in the using.

Drill, Tempering of.—1. A drill heated to a low red, and plunged in a strong solution of chloride of zinc, will drill glass.

2. Heat the drill and rub in cyanide of potassium. The drill should be hot enough to melt the potassium. Heat again to a dark cherry red, and cool it in a very strong brine made with warm, soft water. Do not draw the temper. The drill will look white, but be hard and tough.

3. The drill should be heated to a cherry in a charcoal fire, then plunged in cold water, to which a handful of salt is added. Make the drill bright. Draw to a light straw color.

Screw Gauges.—Heat in melted lead; harden in cold water or brine pickle; polish bright; draw to color (straw) in hot sand. If the steel is homogeneous, there will be no change in size.

Gravers, to Temper.—Instruments larger than drill may be tempered in mercury the same as above, but lead may be used as a substitute for mercury. The lead is lessened about half an inch, and the instrument, made light red hot, is pressed into the cut. The melted lead then surrounds it.

Gun Springs, to Temper.—To temper gun springs, heat them evenly to a low red heat in a charcoal fire, and quench them in water with the cold chill off, keeping them immersed until reduced to the temperature of the water. Place an iron pan containing lard oil and tallow, in about equal quantities, over a fire, and place the springs therein, and heat the pan until its contents take fire; then hold the springs in the flames, turning them over and over and dipping them occasionally in the oil to keep them blazing; when the oil adhering to them blazes freely when they are removed from the flames, place them aside to cool off.

Steel, to Give a Temper to Cut Porphyry.—Make your steel red hot, and plunge it into distilled water from nettles, acanthus and pilosella, or in the very juice pounded out from these plants. Success doubtful.

Knife Blades, to Temper.—Be careful about heating, otherwise the blade will be warped out of shape. When the blade is heated evenly, plunge perpendicularly in a bath of raw linseed oil. The temper should be drawn on a hot iron. The blades may be heated and hardened between two straight pieces of iron.

Tempering Liquid.—1. Saltpeter, 1 oz.; alum, pulverized, 2 teaspoonfuls; salt, 1 teacup; soft water, 2 gal.; never heat over a cherry red nor draw any temper.

2. Water	7½	gal.
Saltpeter	5	oz.
Sal ammoniac	5	oz.
Alum	5	oz.

Draw no temper.

3. Water	2	gal.
Saltpeter	2	oz.
Alum	2	oz.
Sal ammoniac (pulverized)	1	oz.
Salt	1½	lb.

Heat to a cherry red, plunge in, draw no temper.

4. Water	2	gal.
Saltpeter	½	oz.
Pulverized borax	½	oz.
Pulverized sal ammoniac	½	oz.
White vitriol	1	oz.
Salt	1½	pt.

5. Put ½ oz. of corrosive sublimate in 3 qt. of soft water and add 1 handful of common salt. Dissolve, and it is ready for use. This gives toughness and hardness to steel. It is a dangerous poison.

6. Alum	1	oz.
Saltpeter	1	oz
Sal ammoniac	1	oz.
Salt	¾	lb.
Soft water	1½	gal.

Draw no temper.

Mill Chisels, Tempering for Cutting French Burr.—If cast steel is made white-hot it is spoilt; yet if a person takes a chisel, mill pick, or other pointed tool to be repaired, the smith pushes it into the fire. The point is soon white hot. They will now push it in and out of the fire a few times, and at last bring it out red-hot and work it. Of course it is already spoiled; and no matter how low it is tempered, it is next to useless. Take one to the smith, and see that he puts the body of the tool in the fire, leaving the two thin ends uncovered till the middle is red-hot. As soon as the middle is red-hot pull back, and let the thin end just get a dull red heat. It must now be hammered edgeways

first and flatways last of all. It is best to hammer it on the flat part of the anvil, as drawing steel on the edge of the anvil, although a great deal quicker, makes it short in the grain, and always causes the tool to break in the thinnest place. Serve the other end the same, only repeat as soon as it loses its dull red color. The lighter the blows in working steel the tougher it is. The point should be quite as thin as a fitter's chipping chisel, only a little longer, then they will not require doing up so often. When the ends are drawn out the middle will have lost its red heat. The ends can now be filed a little. Now to temper them. Heat them in the flame of the fire, using great care. When a very dull red heat cool in rain water, with the chill taken off, about ¾ in. from the end, and let down to a blue; if it should be too brittle a little lower. Serve the other end the same. Cool all over. Grind the edge rather blunt, and for the first few blows hit as light as possible. A little soapsuds or oil could be poured on the water, but the water is the best. The secret is in working it at as low heat as possible, only keep on repeating very often, and to hit it edgeways as little as possible, but flatways as much as you like.

Mill Picks, to Temper.— 1. There is nothing peculiar in hardening mill picks, only that they should be as hard as possible and moderately tough. The greatest care should be taken to avoid burning the steel. Where there is much of this work to be done, the picks can be heated in a pot of cherry red hot lead, then dipped plumb into clear water at about 60°. Do not draw the temper. The hardening by the ordinary smith's fire can be well done if charcoal is used, and not hurried through the fire. Hurry burns the corners. Much also depends upon the shape of the pick, as to whether it is a sectional or leaf pick, or a thick, solid pick, the last being the most difficult to manage, on account of the sharp edge and thick back. They should be laid across the fire, so as to heat the eyes as fast as the edge.

2. Prepare a mixture of—

Water	1½ gal.
Ammonia	1½ oz.
White vitriol	1½ oz.
Sal ammoniac	1½ oz.
Spirits of niter	1½ oz.
Alum	1½ oz.
Salt	3 oz.

And 1 handful horse hoof parings.

Keep in a jar tightly corked. The pick should be heated to a dark cherry red and cooled in this liquid. Do not draw the temper.

Springs, to Temper.— Tempering of coiled springs requires much judgment, based upon experience with the particular kind of spring that you wish to temper. A coiled spring does not give the faintest idea of its form, size, length, thickness, kind of steel, or whether it is a clock spring or car spring, all of which must be considered in the method of treatment. As a general rule, springs that are slender and liable to lose shape in a common fire should be heated in an oven or muffle, and hardened in water or oil. The temper should be drawn in boiling linseed oil. Springs that have stiffness, like car springs, may be heated in a covered forge fire to good advantage, and hardened in lard oil. The temper can be drawn by burning off.

To Temper Steel Springs.- Heat to an even red heat, rather low, to prevent cracking; quench in lukewarm water. Place in ladle with enough tallow to cover it; heat until tallow burns with a large flame extending beyond ladle, then set the ladle aside and allow it to cool.

Tempering Revolver Springs.—Heat the spring to a cherry red, and plunge in linseed oil. To draw the temper to the desired degree, hold the spring over the fire, and allow the oil to burn away, take away from the fire, put on more oil, and let it burn away. Burn the oil off three times, and plunge in the oil again. The spring is then ready for use. Do not overheat the steel. Test the temper frequently with a file.

How to Temper a Small Spring.—1. Heat the spring to a light red, plunge in cold water; hold the spring over the flame of a small fire of shavings until it becoms black, then hold in the fire until the black disappears. Cool the spring by swinging it in the air.

2. Heat the spring to a cherry red, plunge in cold water, and hold over a small fire until warm. Cool with tallow and burn off the tallow over the fire, repeat this process two or three times, cool in water.

The process of tempering steel consists in reheating hardened steel to a temperature varying with the degree of hardness required, and coloring it by immersion in the same manner. The proper temperature is indicated by the color of the thin film of oxide formed on the surface of the heated metal, according to the following scale:

	Color.	For
220°	Pale yellow	Lancets.
230°	Straw yellow	Razors and surgical instruments.
243°	Golden yellow	Common razors and penknives.
255°	Brown	Cold chisels, shears, scissors.
265°	Brown, dappled with purple	Axes, planes, etc.
277°	Purple	Table knives, large shears
288°	Bright blue	Swords, coiled springs.
293°	Full blue	Fine saws, augers, etc.
316°	Dark blue	Hand and pit saws.

The reheating is generally effected in baths of molten metals or metallic alloys having definite fusing points. Thus, alloys of tin and lead, in varying proportions, may be used up to a temperature of 300°; above which boiling linseed oil and pure lead are to be employed. The tenacity of steel is highly increased by tempering with oil instead of water.

Tempering Steel.—In judging the proper temperature and corresponding hardness, the following table serves admirably. It is often difficult to heat a piece of steel uniformly; conse-

	Composition of Metallic Mixtures.		Melting Point.	Colors.
	Lead.	Tin.		
Lancets	7	4	220°	Hardly pale yellow.
Razors	8	4	228°	Pale yellow to straw yellow.
Penknives	8½	4	232°	Straw yellow.
Pairs of scissors	14	4	254°	Brown.
Clasp knives, joiners' and carpenters' tools	19	4	265°	Purplish colored.
Swords, cutlasses, watch springs	48	4	288°	Bright blue.
Stilettos, boring tools, and fine saws	50	2	292°	Deep blue.
Ordinary saws	In boiling linseed oil		316°	Blackish blue.

quently molten metallic mixtures are employed, chiefly made up of tin and lead; the bright hardened steel is kept in these molten mixtures until it has assumed the temperature of the bath. The foregoing tabulated form exhibits the composition of the metallic baths which have been found to be the best for tempering cutlery

Tempering Cast Steel.—*Dissolve* a small quantity of sal ammoniac *in water*, make the metal red, drop it into the mixture for a second or two, and take it out, leaving enough heat in the metal to draw it back a bit. If left till cold, the steel will be a great deal too hard.

Taps, Tempering of.—Bear in mind that a tap is simply a series of cutters on a bar; hence the cutting parts must be uniformly hard enough to cut, and the base soft as possible to insure durability. This can be best accomplished by dipping at as low a heat as possible and making the outside hard, while the inside will be comparatively soft when rubbed off ready for tempering. Heat a heavy ring (a broken pulley hub is as good as anything), which have on side of your fire for use while hardening taps, and also a heavy pair of tongs, made hot in the same way. Take the lever end of the tap with the hot tongs, and insert the tap in the center of the hot ring, but do not let it touch the sides. It is better to keep turning it round. If the temper draws too fast, where held by the tongs, cool it off, move backward and forward until the right color is attained. This, too, depends on quality of steel and the size and make of the tap, and lastly the purpose for which it is intended.

Tests, Color, for Temper.—Says Mr. J. Richards: "Procure eight pieces of cast steel, about 2 in. long by 1 in. wide and ⅛ in. thick; heat them to a high red heat, and drop them into a salt bath. Leave one without tempering, to show the white shade of extreme hardness, and grind off and polish one side of each of the remaining seven pieces. Then give them to an experienced tool maker to be drawn to seven various shades of temper; ranging from the white piece to the dark blue color of soft steel. On the backs of these pieces paste labels, describing the technical name of the shades and the general uses to which tools of corresponding hardness are adapted. This will form an interesting collection of specimens, and accustom the eye to the various tints, which will, after some experience, be instantly recognized when seen separately."

Tempering, by the Thermometer.—Put the articles to be tempered into a vessel containing sufficient quantity to cover them of oil and tallow, sand, or a mixture of 8 parts bismuth, 5 parts lead, and 3 parts tin, the whole to be brought up to and kept up at the heat corresponding to the hardness required, by means of a suitable thermometer, till heated equally throughout; the articles are then withdrawn and plunged into cold water. If no thermometer is available, it may be observed that oil or tallow *begins to smoke at 430° or straw* color, and that it makes fire on a light being presented, and goes out when the light is withdrawn at 570° or blue.

Tenacity.—Is the resistance to being pulled asunder by the force of tension.

Terpine.—If oil of turpentine is left for a long time in contact with a mixture of nitric acid and alcohol, crystals of terpine form. By boiling an aqueous solution of terpine with a small quantity of sulphuric or other acid, terpinole is formed, and may be separated by distillation. It has the odor of hyacinths.

Terra Cotta. (Baked Clay.)—This term is applied to statues, architectural ornaments, etc., made of pure white clay, fine sand and powdered potsherds, slowly dried and baked to a strong hardness.

Terra Cotta, Cement for. See **Cements.**

Terra Cotta, Lacquer for. See **Lacquers.**

Test Papers. See **Paper.**

Tetter Ointment.—Citrine ointment, 3 drm.; spermaceti ointment, 3 drm.; balsam of Peru, ¾ drm.; carbolic acid, 7½ grn.; oil of lemon, 15 drops.

Textile Fibers, Distinction between.—A. Remont communicates a short process to detect or separate these fibers, which may suffice for ordinary purposes. The fabric to be examined is first dipped, for fifteen minutes, in boiling water containing five per cent. of hydrochloric acid, for the purpose of removing coloring matter and sizing; it is then washed and dried. If at all possible, the woof is then to be separated from the warp, and each examined separately, according to the following scheme:

A. Burn a few fibers.

1. An odor of burnt urine is developed. If this is the case, heat a few fibers with solution of soda, and examine the vapor given off; if ammonia is present, this indicates the presence of an animal fiber.

B. Dip a few fibers into a boiling solution of basic chloride of zinc.

a. The fiber dissolves completely.—Silk.

b. On the addition of hydrochloric acid, an abundant flocculent precipitate is produced.—Silk mixed with wood or vegetable fiber.

c. The chloride of zinc does not dissolve it. Remove the fibers to a boiling, moderately dilute solution of soda.

It dissolves completely.—Wool.

It dissolves partially.—Wool and cotton.

2. No odor of burnt urine is developed.—Vegetable fiber.—*Jour. de Pharm. et de Chim.*, 1881, 135.

Textile Soaps. See **Soaps.**

Textiles, to Fireproof. See **Fireproofing.**

Textiles, to Waterproof. See **Waterproofing.**

Theine $C_8H_{10}N_4O_2$.—An alkaloid extracted from tea. It is identical with caffeine, and may be obtained from tea in the same manner as that substance is from coffee. The best gunpowder tea contains fully 6% of theine, about one-half of which is lost in the present careless mode of making infusion of tea for the table.

Thermometer Scales.—Much annoyance is caused by the great difference of thermometer scales in use in the different civilized countries. The scale of Reaumur prevails in Germany. As is well known, he divides the space between the freezing and boiling points into 80°. France uses that of Celsius, who graduated his scale on the decimal system. The most peculiar scale of all, however, is that of Fahrenheit, a renowned German physicist, who, in 1714 or 1715, composed his scale, having ascertained that water can be cooled under the freezing point, without congealing. He therefore did not take the congealing point of water, which is uncertain, but composed a mixture of equal parts of snow and sal ammoniac—about 14° R. This scale is preferable to both those of Reaumur and Celsius, or, as it is also called, centigrade, because: 1. The regular temperatures of the moderate zone move within its two zeros, and can therefore be written without + or −. 2. The scale is divided so finely that it is not necessary to use fractions whenever careful observations are to be made. These advantages, although drawn into question by some, have been considered sufficiently weighty that both Great Britain and America have retained the scales, while the nations of the Continent, France, Spain, etc., use the other two.

The conversion of any one of these scales in-

to another is very simple, and easily made. To change a temperature as given by Fahrenheit's scale into the same as given by the centigrade scale, subtract 32° from Fahrenheit's degrees, and multiply the remainder by $\frac{5}{9}$. The product will be the temperature in centigrade degrees.

To change from Fahrenheit's to Reaumur's scale, subtract 32° from Fahrenheit's degrees, and multiply the remainder by $\frac{4}{9}$. The product will be the temperature in Reaumur's degrees.

C.	R.	F.	C.	R.	F.	C.	R.	F.
−30	−24·0	−22·0	14	11·2	57·2	58	46·4	136·4
−29	−23·2	−20·2	15	12·0	59·0	59	47·2	138·2
−28	−22·4	−18·4	16	12·8	60·8	60	48·0	140·0
−27	−21·6	−16·6	17	13·6	62·6	61	48·8	141·8
−26	−20·8	−14·8	18	14·4	64·4	62	49·6	143·6
−25	−20·0	−13·0	19	15·2	66.2	63	50·4	145·4
−24	−19·2	−11·2	20	16·0	68·0	64	51·2	147·2
−23	−18·4	−9·4	21	16·8	69·8	65	52·0	149·0
−22	−17·6	−7·6	22	17·6	71·6	66	52·8	150·8
−21	−16·8	−5·8	23	18·4	73·4	67	53·6	152·6
−20	−16·0	−4·0	24	19·2	75·2	68	54·4	154·4
−19	−15·2	−2·2	25	20·0	77·0	69	55·2	156·2
−18	−14·4	−0·4	26	20·8	78·8	70	56·0	158·0
−17	−13·6	1·4	27	21·6	80·6	71	56·8	159·8
−16	−12·8	3·2	28	22·4	82·4	72	57·6	161·6
−15	−12·0	5·0	29	23·2	84·2	73	58·4	163·4
−14	−11·2	6·8	30	24·0	86·0	74	59·2	165·2
−13	−10·4	8·6	31	24·8	87·8	75	60·0	167·0
−12	−9·6	10·4	32	25·6	89·6	76	60·8	168·8
−11	−8·8	12·2	33	26·4	91·4	77	61·6	170·6
−10	−8·0	14·0	34	27·2	93·2	78	62·4	172·4
−9	−7·2	15·8	35	28·0	95·0	79	63·2	174·2
−8	−6·4	17·6	36	28·8	96·8	80	64·0	176·0
−7	−5·6	19·4	37	29·6	98·6	81	64·8	177·8
−6	−4·8	21·2	38	30·4	100·4	82	65·6	179·6
−5	−4·0	23·0	39	31·2	102·2	83	66·4	181·4
−4	−3·2	24·8	40	32·0	104·0	84	67·2	183·2
−3	−2·4	26·6	41	32·8	105·8	85	68·0	185·0
−2	−1·6	28·4	42	33·6	107·6	86	68·8	186·8
−1	−0·8	30·2	43	34·4	109·4	87	69·6	188·6
0	0·0	32·0	44	35·2	111·2	88	70·4	190·4
1	0·8	33·8	45	36·0	113·0	89	71·2	192·2
2	1·6	35·6	46	36·8	114·8	90	72·0	194·0
3	2·4	37·4	47	37·6	116·6	91	72·8	195·8
4	3·2	39·2	48	38·4	118·4	92	73·6	197·6
5	4·0	41·0	49	39·2	120·2	93	74·4	199·4
6	4·8	42·8	50	40·0	122·0	94	75·2	201·2
7	5·6	44·6	51	40·8	123·8	95	76·0	203·0
8	6·4	46·4	52	41·6	125·6	96	76·8	204·8
9	7·2	48·2	53	42·4	127·4	97	77·6	206·6
10	8·0	50·0	54	43·2	129·2	98	78·4	208·4
11	8·8	51.8	55	44·0	131·6	99	79·2	210·2
12	9·6	53·6	56	44·8	132·8	100	80·0	212·0
13	10·4	55·4	57	45·6	134·6			

To change the temperature as given by the centigrade scale into the same as given by Fahrenheit, multiply the centigrade degrees by $\frac{9}{5}$ and add 32° to the product. The sum will be the temperature by Fahrenheit's scale.

To change from Reaumur's to Fahrenheit's scale, multiply the degrees on Reaumur's scale by $\frac{9}{4}$, and add 32° to the product. The sum will be the temperature by Fahrenheit's scale.

For those who wish to save themselves the trouble we have calculated the preceding comparative table.

Thread, Wax for. See **Waxes.**

Tiers Argent. See **Alloys.**

Tiles, to Cleanse. See **Cleansing.**

Tiles, Roof, Coating for.—First dip in a hot solution of soft soap, and when dry, dip in a strong solution of alum. This treatment has proved most successful.

Tiles, Glazed, to Cut.—Cut the glazed face with a diamond, the rough back with a file, and lightly tap along the furrow with a cold chisel. For fixing them where they have to stand heat, use Keene's cement.

Timber, to Fireproof. See **Fireproofing.**

Timber, to Preserve. See **Wood, Preservation of.**

Tinctures.—Tinctures are alcoholic solutions of the active medicinal properties of the principal ingredients from which they are prepared. They are compound and simple. The menstruum most commonly employed is proof spirit (diluted alcohol U. S. P.), sometimes called (see alcohol) rectified spirit (alcohol U. S. P.), and occasionally ether. Ammonia is sometimes conjoined with the spirit, in which case the solution is termed an ammoniated tincture. Rectified spirit or druggists' alcohol is alcohol with 15% of water, and its specific gravity is 0·835. Proof spirit or diluted alcohol is composed of equal parts of rectified spirit and water, 0·935. The choice of menstruum is usually determined, unless where special objects are in view, by their respective solvent powers over the ingredients used. Tinctures may be prepared by digestion, infusion, maceration, percolation or displacement, and occasionally with either method, with the aid of heat. In their preparation by either method, the substances acted upon, except balsams, oils, etc., should be in the dry state, and made into such condition by bruising, slicing, or grinding (in the form of coarse powder usually

is preferable), that the least impediment shall be offered to the action of the menstruum. When the substance is fluid, as certain balsams, and the essential oils in preparing the so-called essences, the solutions are made by merely mixing them with the alcohol.

To Clarify Tinctures.—In ordinary cases it is sufficient for clarifying purposes to allow the tincture to stand undisturbed for a few days, and then pour off the clear portion, through an ordinary filter bag, but a more transparent preparation is made by passing it through filter paper.

1. *To Keep Tinctures.*—Tinctures should be kept in closely stoppered bottles in order to prevent evaporation, by which their relative strength would be greatly increased. In the case of laudanum and paregoric, serious, and even fatal accidents have occurred from neglect of this precaution.

2. *General Directions for Preparing.*—The following general directions in the preparation of tinctures are given in the United States Pharmacopœia.

Tinctures, when prepared by maceration, should be frequently shaken during the process, which should be conducted in glass vessels well stopped. When displacement (percolation) is employed, great care should be taken to observe the directions given, so that the substances treated may be, as far as possible, exhausted of their soluble principles, and a perfectly clear tincture obtained.

Cantharides, Tincture of.—

Spanish flies (in coarse powder)..	¼ oz.
Proof spirit	1 pt.

Macerate, with agitation, for a week, and then filter, with expression. Added to pommades, oils, and washes, to promote the growth of the hair; but it is inconveniently weak for the purpose. It is poisonous if swallowed.

Iodine, Tincture of.—

Iodine.....	½ oz.
Iodide of potassium.....	¼ oz.
Rectified spirit.....	1 pt.

Mix, and agitate until solution is complete. This is the *tinctura iodi* of the British Ph. The compound tincture (*tinctura iodinii composita*) of the London Ph. contains 4 times this quantity of the iodide. The *tinctura iodinei* of the Edin. Ph. contains 1¼ oz. (troy) of iodine per pt. (without any iodide), or about 2½ times more iodine than the former. Used externally as a paint (iodine paint), and caustic; internally, in doses of 5 to 20 drops in scrofula, enlarged and indurated glands, etc.

Tinctures, to Dilute.—The rule is to reduce the strength of the tincture one hundred times at every dilution, thus: 1 part (by weight) of standard tincture (=a) + 100 parts diluent=a^1; 1 part a^1 + 100 parts diluent=a^2, and so on. The diluent is usually either water or a spirit just strong enough to hold the substances in solution.

Tin, Fluxes for. See **Fluxes.**

Timber, to Test the Soundness of.—To test the soundness of a piece of timber, apply the ear to the middle of one of the ends, while another person strikes upon the opposite extremity. If the wood is sound and of good quality, the blow is very distinctly heard, however long the beam may be. If the wood is disaggregated by decay or otherwise, the sound will be for the most part destroyed.

Tin Amalgam. See **Amalgam.**

Tin, to Bronze. See **Bronzing.**

Tin, to Clean. See **Cleansing.**

Tin, to Japan. See **Japanning.**

Tin, Lacquer for. See **Lacquering.**

Tinning, to Tin Gray Iron Castings.—1. Cleanse the castings by pickling in dilute sulphuric acid (1 to 20 of water) and scouring with sand if necessary. Then boil them in concentrated aqueous solution of stannate of soda, with a quantity of granulated tin. To copper iron castings, clean the iron as above and tumble it for a few minutes in sawdust moistened with a solution of copper in two gallons of water made slightly acid with sulphuric acid. Wash immediately in hot water.

2. To tin small castings, clean and boil them with scraps of block tin in a solution of cream of tartar.

To Tin Iron Cold.—Take equal parts of quicksilver and block tin and melt them together. Mix also equal parts of muriatic acid and water. Apply the amalgam with a clean rag steeped in the acid mixture.

Tacks, to Tin.—A process of tinning iron tacks is to triturate chloride of zinc with a large quantity of oil and heat it in an oscillating vessel. As soon as this has reached the proper temperature, throw in the tacks and the necessary quantity of metallic tin, and after a few seconds dip them out with wire gauze and cast them in water.

To Give Tin a Crystalline Appearance.—1. The *moiré metallique*, or crystallized tin plate, is much used for trunks and fancy articles, and is usually prepared from well annealed and well tinned charcoal iron plates, by rinsing the plates with dilute nitric or nitro-muriatic acid, and then with water. The cleansed plates are dipped for a few moments in aqua regia (nitric acid) and muriatic acid, 3 parts, diluted with 1 to 3 volumes of water and heated to about 180° F., and after a short exposure, rinsed in running water. Repeat, if necessary, until the crystals are properly developed; then rinse in hot water, and dry in the air. Then oil or lacquer. Hot tannin or caustic soda solutions may also be used to develop the crystalline structure.

Tin, Crystals on.—2. Dip the warm plate in nitro-muriatic acid diluted with 2 volumes soft water just long enough to develop the larger figures; then immediately plunge into a large quantity of cold water, after which dip in boiling water, which on removal will cause the plate to dry spontaneously. Lacquer immediately. A similar result is obtained by exposing the plate as it comes from the tin bath, and while the metal is still in a semi-fused condition, to jets of cold air for a few moments.

3. Crystallized tin plate has a variegated primrose appearance, produced upon the surface by applying to it in a heated state some dilute nitro-muriatic acid for a few seconds, then washing it with water, drying, and coating it with lacquer. The figures are more or less diversified, according to the degree of heat and relative dilution of the acid. The *Iron and Steel Trade Journal* (London) tells how this crystallization is produced. Place the tin plate, slightly heated, over a tub of water, and rub its surface with a sponge dipped in a liquid composed of 4 parts nitric acid and 2 parts distilled water, holding 1 part common salt or sal ammoniac in solution. When the crystalline spangles seem to be thoroughly brought out, the plate must be immersed in water, washed either with a feather or a little cotton, taking care not to rub off the film of tin that forms the feathering, forthwith dried with a low heat, and coated with a lacquer varnish; otherwise it loses its luster in the air. If the whole surface is not plunged at once in cold water, but is partially cooled by sprinkling water on it, the crystallization will be finely variegated with large and small figures. Similar results will be obtained by blowing cold air through a pipe on the tinned surface, while it is just passing from the fused to the solid state.

4. Sulphuric acid, 4 oz.; soft water, 2 to 3 oz., according to strength of the acid; salt, 1¼ oz. Mix; heat the tin hot over the stove. Apply the mixture with a sponge, and wash off at once with clean water. Dry the tin, and varnish with dammar varnish.

5. Moiré Metallique.—This is produced by the action, for a few seconds, of dilute nitro-muriatic acid on tin gently heated, then washing in hot water, drying, and lacquering. The degree of heat and the strength of the acid modify the appearance. The following is the most approved method of producing this effect: The plate iron to be tinned is dipped into a tin bath, composed of 200 parts of pure tin, 3 parts of copper, and 1 part of arsenic. Thus tinned, the sheet iron is then submitted to the seven following operations:

a. Immersing in lye of caustic potassa, and washing.

b. Immersing in diluted aqua regia, and washing.

c. Immersing in lye of caustic potassa, and washing.

d. Quickly passing through nitric acid, and washing.

e. Immersing in a lye of caustic potassa, and washing.

f. Immersing in aqua regia, and washing.

g. Immersing in a lye of caustic potassa, and washing.

The coat of oxide must be entirely removed at each washing, and the last washing should be in hot water. The varnish recommended is copal in spirit.—*Herberger.*

Tin Plating Processes.—Perhaps the best and cheapest substitute for silver as a white coating for tableware, culinary vessels, and the innumerable articles of manufacture requiring such a coating is pure tin. It does not compare favorably with silver in point of hardness or wearing qualities, but it costs very much less than silver, is readily applied, and easily kept clean and bright.

There are several methods in use by which small articles, wire, etc., of iron, copper, brass, zinc and composition, are tin plated. These are: 1. By contact with melted tin. 2. By tin amalgam. 3. By simple immersion. 4. By battery.

The contact process is that by which all sheet tin, or, more properly, tinned sheet iron is produced.

1. In tinning hollow ware on the inside the metal is first thoroughly cleansed by pickling it in dilute sulphuric acid, and scouring it with fine sand. It is then heated over a fire to about the melting point of tin, sprinkled with powdered rosin, and partly filled with melted pure grain tin covered with rosin to prevent its oxidation. The vessel is then quickly turned and rolled about in every direction, so as to bring every part of the surface in contact with the molten metal.

The greater part of the tin is then thrown out, and the surface rubbed over with a brush of tow to equalize the coating. The operation is repeated, if necessary. The vessels usually tinned in this manner are of copper and brass, but with a little care in cleansing and manipulating, iron can also be satisfactorily tinned in this manner.

The vessels must be hot enough to keep the tin contained in them fused.

2. The amalgam process is not used so much as it was formerly. It consists in applying to the clean and dry metallic surface a film of a pasty amalgam of tin with mercury, and then exposing the surface to heat, which volatilizes the latter, leaving the tin adhering to the metal.

3. The immersion process is best adapted to coating articles of brass or copper. When immersed in a hot solution of tin properly prepared the metal is precipitated upon their surfaces. One of the best solutions for this purpose is the following:

Ammonia alum	17¼ oz.
Boiling water	12½ oz.
Protochloride of tin	1 oz.

The articles to be tinned, first thoroughly cleansed, are put into the hot solution until properly whitened.

4. A better coating can be obtained by using the following bath, and placing the pieces in contact with a strip of clean zinc, also immersed:

Bitartrate of potassium	14 oz.
Water (soft)	24 oz.
Protochloride of tin	1 oz.

It should be boiled for a few minutes before using.

5. The following is one of the best solutions for plating with tin by the battery process:

Potassium pyrophosphate	12 oz.
Protochloride of tin	4½ oz.
Water	20 oz.

The anode or feeding plate used in this bath consists of pure Banca tin. This plate is joined to the positive (copper or carbon) pole of the battery, while the work is suspended from a wire connected with the negative (zinc) pole. A moderately strong battery is required, and the work is finished by scratch-brushing.

6. In Weigler's process a bath is prepared by passing washed chlorine gas into a concentrated aqueous solution of stannous chloride to saturation, and expelling excess of gas by warming the solution, which is then diluted with about ten volumes of water and filtered, if necessary. The articles to be plated are pickled in dilute sulphuric acid, and polished with fine sand and scratch-brush, rinsed in water, loosely armed with zinc wire or tape, and immersed in the bath for ten or fifteen minutes at ordinary temperatures. The coating is finished with the scratch-brush and whiting.

By this process iron—cast or wrought—steel, copper, brass, and lead can be tinned without a separate battery. The only disadvantage of the process is that the bath soon becomes clogged up with zinc chloride, and the tin salt must be frequently renewed.

7. In Hern's process a bath composed of—

Tartaric acid	2 oz.
Water	100 oz.
Soda	3 oz.
Protochloride of tin	3 oz.

is employed instead of the above. It requires a somewhat longer exposure to properly tin articles in this than in Weigler's bath. Either of these baths may be used with a separate battery.

Tinning Iron Articles by Simple Immersion.—A solution is first made by dissolving with the aid of heat, in an enameled pan, protochloride of tin (fused), 2½ grm.; ammonia alum, 75 grm.; water, 5 liters. The chloride of tin is readily made by dissolving grain tin in hydrochloric acid, with the aid of heat, care being taken to have an excess of metal in the dissolving flask. When the bubbles of hydrogen gas which are evolved cease to be given off, the action is complete. If the solution be evaporated at a gentle heat until a pellicle forms on the surface, and the vessel then set aside to cool, needle like crystals are obtained, which may be separated from the mother liquor by tilting the evaporating dish over a second vessel of the same kind. When all the liquor has thoroughly drained, it should in its turn be again evaporated, when a fresh crop of crystals will be obtained. The crystals should, before weighing, be gently dried over a sand bath. When the solution of tin and alum has been brought to a boil, the iron articles, after being well cleaned and rinsed in water, are to be immersed in the liquid, when they quickly become coated with a delicately white film of a dead or matted appearance, which may be rendered bright by means of bran in a revolving cask, or in a leathern bag shaken by two persons, each holding one end of the bag. To keep up the strength of the tinning bath, small quantities of the fused chloride of tin are added from time to time.

Copper, Retinning.—1. Make the copper chem-

ically clean by washing with a saturated solution of zinc in muriatic acid, the acid to be weakened with water to half strength after the dissolving of the zinc. Heat the copper vessel and pour in a small quantity of metal, of tin, 1 part, lead 1 part, and shake or tip the vessel until the tinning runs over the parts. Or, wipe the melted tin over the bare places with a cotton canvas pad.

2. The best way to tin old copper utensils is to thoroughly clean them with sand and oxalic acid, and tin with a large copper soldering iron, using chloride of zinc and sal ammoniac (soldering fluid) for flowing the tin. It can also be done by heating the vessel and flushing melted tin over the surface, first sprinkling it with powdered resin. You may succeed in this after a few trials.

Tin, Oxymuriate.—This name is applied to a more or less perfect bichloride of tin, in solution. For the use of tissue printers, it is generally prepared by the action of nitric acid upon tin crystals, with due precautions. The names *nitro*-muriate, perchloride and permuriate are sometimes given to similar preparations

Tin Powder.—1. (Ph. E). Melt grain tin in an iron vessel, pour it into an earthenware mortar heated a little above its boiling point, and triturate briskly as the metal cools; lastly, sift the product, and repeat the process with what remains in the sieve.

2. (Ph. D.) Melt grain tin in a black lead crucible and, while it is cooling, stir it with a rod of iron until it is reduced to powder; let the finer particles be separated by means of a sieve, and when, after having been several times in succession shaken with distilled water, the decanted liquor appears quite clear, let the product be dried for use.

Tin, to Plate with. See **Electro-Metallurgy.**

Tin, to Prepare for Tinning.—To prepare tin for *tinning* brass, copper and iron.—Melt the metal in a crucible which has previously been slightly warmed; and at the moment the metal begins to set, and when it is very brittle, pound it up rapidly, and sift when cold to remove any large particles.

Tin, to Solder. See **Soldering.**

Tin Tree.—1. Chloride tin, 3 drm.
2. Nitric acid, 10 drops.
3. Piece of zinc attached to copper wire.

Put No. 1 into a glass vessel with sufficient water to 3 parts fill; then add No. 2; shake well until dissolved. Now place No. 3 through a cork and insert in solution, so that no part shall touch top, bottom or side of glass vessel. Let the whole rest quietly for a short time. The tree will grow and have a very lustrous appearance.

Tinning. See **Tin,** above, *Tinning* and *Tin Plating* processes.

Tin Types. See **Photography.**

Tisanes (Ptisans). — Fluid medicines, consisting for the most part of aqueous infusions, or decoctions of substances possessing little activity, and intended to be drunk in considerable quantity. They are much used in France.

Tissier's Metal. See **Alloys.**

Toilet and Toilet Preparations. See **Cosmetics,** and also the following:

Abrasions, Bandoline (see Hair), Baths, Bay Rum (see Hair), Bites and Stings, Boils, Breath, Smoker's; Bruises, Burns and Scalds, Chaps, Chilblains, Cold Sores, Cologne, Corns, Cosmetique, Court Plaster (see Plasters), Dandruff (see Hair), Depilatories (see Hair), Escharotics, Extracts, Essences, Eyelashes, Freckles, Feet, Hair, Hands (see Skin), Moles, Nævus (see Skin), Nails, Oils—Hair (see Hair); Pastils, Fumigating, Perspiration, Powders, Pomades, Poultices, Rouges and Face Paints, Sachet Powders (see Powders), Scalp, Smelling Salts (see Salts), Skin, Sweating (see Perspiration), Tattoo Marks, Teeth, Warts, Wrinkles.

French Toilet Articles.—Mr. Martenson, of St. Petersburg, who, it will be remembered, was one of the Russian delegates to the International Pharmaceutical Congress, has been analyzing a number of French preparations for the toilet, most of which are familiar to our readers, at any rate by name and repute.

1. *Eau de Fleurs de Lys.*—(Planchon & Riet, Paris.)—An infallible banisher of freckles, etc., etc. The bottle contains 100 grm. of a milky fluid, made up of 97% water, 2·5% precipitated calomel, and a small quantity of common salt and corrosive sublimate, and scented with orange flower water.

2. *Eau de Blanc de Perles.* The bottle contains 120 grm. of a weak alkaline solution, with a thick deposit of 15% of carbonate of lead, and scented with otto of roses and geranium.

3. *Nouveau Blanc de Perle, Extra Fin.*—(Lubin, Paris.)—The bottles contain 35 grm. of a liquid consisting of water, holding in suspension about equal parts of zinc oxide, magnesic carbonate, and powdered talc, perfumed with otto of roses.

4. *Lait de Perles.*—A close imitation of No. 3, the bottle holding nearly three times the quantity for the same price. The amount of the precipitate in this case is 20%.

5. *Lait de Perles.*—(Legrand, Paris.)—The bottles contains 65 grm. of a thick white fluid, the precipitate from which consists of zinc oxide and bismuth oxychloride, and is scented with rose water.

6. *Lait Antiphélique.*—(Candès & Co., Paris.)—Each bottle contains 140 grm. of a milky fluid, smelling strongly of camphor, and having an acid reacton. It contains alcohol, camphor, ammonic chloride, ½% of corrosive sublimate, albumen, and a little free hydrochloric acid.

7. *Lait de Concombres.*—The bottle contains 160 grm. of a very inelegantly made emulsion, smelling of very common rose water, with an unpleasant twang about it, and giving a strongly alkaline reaction. It consists of soap, glycerin, and cotton seed oil, made into a semi-emulsion.

8. *Crême de Fleurs des Lys, Blanc de Ville Onctueux.*—About 30 grm. of a kind of weak ointment contained in a small pomatum pot prettily ornamented. It is simply a salve made of wax oil, and possibly lard, mixed with a large proportion of zinc oxide, and smelling of inferior otto of roses.

9. *Pâte de Velonas.*—This paste consists of almond, and possibly other meal, mixed with soap powder, and has a strong, alkaline reaction. It is scented with orris root.

10. *Rouge Végétal.*—The box contains 8½ grm. of raspberry colored powder, consisting chiefly of China clay and talc, tinted to the proper depth with extract of cochineal.

11. *Rouge Extra Fin Foncé.*—A small square bottle containing 11 grm. of a deep red solution, smelling of otto of roses and ammonia. It consists of a solution of carmine in ammonia, with an addition of a certain amount of alcohol.

12. *Rouge de Dorin, Extract des Fleurs des Indes.*—A round pot containing a porcelain disk, covered with about 6 grm. of a bright red paste, which is a mixture of carthamin or safflower with talc. This rouge, which differs from all the others, is harmless and effectual, but must bear a high profit, seeing that the ingredients cost only a few cents, while it sells in St. Petersburg at a dollar a pot.

13 *Etui Mystérieux ou Boite de Maintenon.*—A prettily got up box containing red and white paint, and two sticks of black and blue cosmetic for the eyebrows and veins, with camel's hair pencils for applying the latter. Sells in St. Petersburg at $1.10.

14. *Philidore.—Remède Specifique pour ôter les Pellicules de la tête. etc.*—The bottle contains 100 grm. of a strong alkaline solution smelling

strongly of ammonia, and containing potash, ammonia, alcohol, glycerine, and eau de cologne.

15. *Colorigène Rigaud.*—A blue bottle containing 160 grm. of a clear fluid, with a slight black deposit, consisting of a mixture of equal parts of a 1½ solution of sodic hyposulphate and 4% solution of lead acetate. Of course the longer this solution is kept, the more lead sulphate it deposits. It sells in St. Petersburg at $1.60 per bottle. It is also stated to be much more powerful if used in conjunction with the *Pommade Miranda Rigaud.* This beats Mrs. Allen completely out of the field.—*Pharmaceutische Zeitschrift für Russland.*

Tobacco, Plug.—Strip the tobacco, sprinkle the leaves with a liquor of white sugar, black licorice and water; make into rolls, and while moist press flat in moulds.

Toilet Soaps. See **Soaps.**

Toilet Powders. See **Powders.**

Tokay. See **Wines.**

Tombac. See **Alloys.**

Tombstones, Ink for. See **Inks.**

Toning Baths. See **Photography.**

Tonquinol.—Tonquinol is a new compound offered as a substitute for musk, and is said by the patentees (Germany) to be derivative of a nitrited terpene and a nitrited sulpho-acid of xylol. Tonquinol is in the form of a white crystalline powder, which, after solution in 50 parts of alcohol, may be mixed with water in all proportions. It is claimed to be very permanent and cheaper than Baur's artificial musk.

Tools, to Prevent Rust on. See **Rust.**

Tools, Sharpening of.—*Glycerine for Sharpening Edged Tools.*—Instead of oil, which thickens and makes the stones dirty, a mixture of glycerine and alcohol is used by many. The proportions of the mixture vary according to the instrument operated upon. An article with a large surface, a razor for instance, sharpens best with a limpid liquid, as three parts of glycerine to one of alcohol. For a graving tool, the cutting surface of which is very small, as is also the pressure exercised on the stone in sharpening, it is necessary to employ glycerine almost pure, with but two or three drops of alcohol.

Tools, Varnish for. See **Varnishes.**

Toothache, Remedies for. See **Teeth, the.**

Tortoise Shell, Cement for. See **Cements.**

Tortoise Shell, to Finish.—Tortoise shell is finished by scraping. Then it is polished with pulverized charcoal and water on a woolen cloth perfectly free from grease. This is followed by water and washed chalk or whiting, the article being moistened with vinegar. Finally it is hand-rubbed with dry whiting or rottenstone.

Tortoise Shell, Imitation of.—1. The dark spots in horn that are made to represent tortoise shell are produced by using a strong aqueous solution of silver nitrate mixed with gum arabic so as to flow properly from a brush. A little red lead may be mixed with it to give body. After standing an hour soak in soft water for several hours before finishing. Pieces of horn may be united by softening the edges with boiling water and then submitting to powerful pressure while surrounded with boiling water.

2. The imitation of tortoise shell with horn is made as follows: Mix an equal quantity of quicklime and red lead with soap lees; lay it on the horn with a small brush in imitation of the mottle of the tortoise shell; when it is dry, repeat it two or three times; or grind 1 oz. of litharge and ½ oz. of quicklime together, with q. s. of liquid potassium carbonate to make it of the consistence of paint. Put it on the horn with a brush in imitation of tortoise shell, and in three or four hours it will have produced the desired effect. It may then be washed off with clean water; if not deep enough, it may be repeated. The original preparation consists in roasting the horn over a fire made of the stalks of furze; when rendered soft it is slit on one side, and kept expanded flat between a pair of tongs; it is then placed between iron plates, which are greased. The horns are suffered to remain until they are cooled; they are then soaked in water enough to be pared down to the required thinness, with a large knife worked horizontally on a block. Their transparency is thus acquired; and after being immersed in lye, they are polished with whiting and the coal of burnt willow.

Tortoise Shell, Japan. See **Japans.**

Tortoise Shell, to Join or Weld.—1. Bring the edges of the pieces of shell to fit each other, observing to give the same inclination of grain to each; then secure them in a piece of paper, and place them between hot irons or pincers; apply pressure, and let them cool. The heat must not be so great as to burn the shell; therefore try it first on a white piece of paper.

2. Small pieces of good tortoise shell may be joined so as to form one large apparently seamless piece in the following manner: Slope off the margins of the shells for a distance of about a ¼ of an in. from the edge. Then place them so that the margins overlap one another; and thus arranged put them in an iron press and immerse in boiling water for some time. The pieces by this means become so perfectly united that the joint cannot be seen. The filings and very small scraps may be softened in hot water and consolidated by hydraulic pressure in metal moulds. Protracted heating of tortoise shell darkens it, and greatly lessens its beauty.

Touch Paper. See **Pyrotechny.**

Tourbillion. See **Pyrotechny.**

Tournay's Metal. See **Alloys.**

Toys, Composition for. See **Compositions.**

Toys, Paints for. See **Paints.**

Toys, Varnish for. See **Varnishes.**

Tracing Cloth.—

1. Boiled linseed oil (bleached)	10 lb.
Lead shavings	½ lb.
Zinc oxide	2½ lb
Venetian turpentine	¼ lb.

Boil for several hours, then strain, and dissolve in the strained composition 2½ lb. white gum copal. Remove from the fire, and when partly cold, add oil of turpentine (purified), sufficient to bring it to proper consistence. Moisten the cloth thoroughly in benzole and give it a flowing coat of the varnish.

2. Varnish the cloth with Canada balsam dissolved in turpentine, to which may be added a few drops of castor oil, but do not add too much, or it will not dry. Try a little piece first with a small quantity of varnish. The kind of cloth to use is fine linen; don't let the varnish be too thick.

Tracing Paper. See **Paper.**

Tracings, to Color.—It is always best to color tracings on the back, as the ink lines are liable to be obliterated when the color is applied. Mix the colors very dark, so that they may appear of proper depth on the other side. If ink or color does not run freely on tracing cloth, mix both with a little ox gall.

Transfer Ink. See **Inks.**

Transfer Paper. See **Paper.**

Transferring.—*Engravings, to Transfer.*—Soak the picture in water. Varnish the plate of glass with dammar varnish or Canada bal-

sam. When just tacky, remove the picture from the water and place it face downward on the varnish side of the glass, gently rub it on, seeing that no air bubbles are left between paper and varnished glass. Let it dry until perfectly hard. Then with the wet finger tip rub off the paper until little more than the design is left. Varnish a second time and allow to dry. The result is apt to be either too pale or too obscure.

Transfers to Boxwood, for Engraving.—A solution of potash or lye is used to soften prints, by means of which, and heavy pressure, they are transferred to boxwood and then re-engraved by hand. In order to make a printing block without re-engraving as above, the photo process must be employed.

Transferring to Glass.—Any picture, print or even clipping from newspapers, any engraving, no matter in how many colors, or on what kind of paper, may be transferred to glass, says a contemporary, only the treatment of the different kinds of paper differs. Proceed in the following manner: Place the object to be transferred, face downward, upon a larger sheet of manila paper; prepare a solution of from one to three per cent. of nitric acid in water, according to thickness and strength of paper, and how strong it was sized; ordinary newspapers and printings or engravings on unsized glaze paper require even less than one per cent. nitric acid—one of the purposes of adding nitric acid is to remove the sizing out of the paper. This solution apply with a sponge to the back of your object to be transferred; be careful not to overdo it; you only want to render the paper soft but not wet. Continue sponging with this solution until you see the printing plainly; that is, until the paper becomes quite transparent.

To prepare the glass for transferring, proceed as follows: Clean the glass plate thoroughly with alcohol by means of a ball of clean cotton; dry it off well; wash it with turpentine; dry it off again; place the glass plate upon a smooth elastic layer—for instance, flannel—and with this elastic layer upon a table, or better yet, upon a rubber blanket in the litho hand-press. Now coat the cleaned surface with a thin coat of half turpentine and half dammar varnish; let it dry from ten minutes to one day according to temperature and thickness of dammar varnish. The coating should not be allowed to dry entirely; it should be a trifle adhesive. Lay your impression face downward upon the glass plate; it is important that neither acid nor water touches the surface during the entire process. To properly lay down the impression, take it up with both hands by holding the left hand under corner and the right hand upper corner; be careful not to get any air bubbles under the sheet. This is best accomplished by marking upon the plate the exact position and size of the sheet.

Laying down the paper first, adjust the right hand upper corner to the mark on the plate, hold it there with the tip of your finger and adjust the left hand lower corner, but be careful to avoid air bubbles.

Press the sheet to the adhesive dammar coat. This may be done in many different manners. It does not require a very strong pressure, but it should be observed that each and every spot has to be pressed repeatedly against the plate. When the paper sticks quite smoothly to the plate, fan it perfectly dry, and then, with wet finger tips, slowly rub off the paper.

If this is done with great care, you will remove every vestige of paper, and the print, of whatever color or nature it may be, will remain on the glass plate. Upon this apply another coat of dammar varnish containing very little turpentine. With too much turpentine, you run the risk of washing the entire picture from the plate again.

Transferring Engravings to Paper.—1. The liquid used for this purpose may be made by dissolving 1½ drm. of common yellow soap in 1 pt. of hot water, adding when nearly cool, ¾ fl. oz. of spirit of turpentine and shaking thoroughly together. Apply the fluid liberally to the surface of the engraving or other printed matter with a soft brush or sponge (being careful not to smear the ink, which soon becomes softened), and allow it to soak for a few minutes. Then well damp the plain paper, on which the transfer is to be made, place it upon the engraving and subject the whole to moderate pressure for about one minute. On separating them a reversed transfer will be found on the paper. The transfer will not be equal in intensity to the original, as only a part of the printer's ink is removed. If the ink be very old, a longer soaking and more pressure may be necessary.—*English Mechanic.*

2. Engravings may be transferred on white paper as follows: Place the engraving a few seconds over the vapor of iodine. Dip a slip of white paper in a weak solution of starch, and when dry, in a weak solution of oil of vitriol. When again dry, lay a slip upon the engraving and place both for a few minutes under a press. The engraving will be reproduced in all its delicacy and finish.

Transfer Ornamenting.—There are many different ways of putting on the ornament, some preferring one way, others a different method, according to circumstances and individual skill. We shall endeavor to give the most simple and successful method known.

First, let it be understood that all pictures that show the colors complete are only suitable for white or very light colored brown; those that are covered with a white grounding, gold, metal, or silver leaf, can be used on any color, light or dark. After getting the work ready for ornamenting, give the picture a smooth, thin coat of some quick drying copal varnish, thinned with turpentine (other preparations are used of which we will speak hereafter), being careful not to go beyond the outline of the design. Allow it to dry until it has a good tack, and put it on the work in its proper place. Roll it smooth with an India rubber roller, or smooth it with a paper folder, until every part adheres well. (For very large pieces, it is well to lay them, after they have the right tack, between 2 sheets of damp blotting paper. It will stretch the paper and make a smooth transfer.) Now wet the paper, smoothing it down at the same time, until it has absorbed all the water possible; leave it about a minute, and pull off the paper carefully. Should any parts of the design still adhere to the paper, press it down again, wet-rub it until it separates easily.

After having removed the paper, press the design on well and wash and dry it off. Should any blisters appear, prick them with a pin and press down. In a few hours the design may be varnished, which will increase the brilliancy of the colors.

An improved method has been invented by Mr. C. P., of New York City, which saves time and works with more certainty. The design is coated with a transfer cemen of his own manufacture, without regard to outline, transferred as usual, and the traces of the cement around the design washed off, with the detergent (also his own invention), which will remove every particle of cement without injuring the colors or gold in the least. A few drops poured on a sponge or chamois skin are sufficient.

For fine ornaments, having many fine lines and touches, it is necessary to use these preparations to make a neat job.

Pictures, to Transfer to Wagons.—Cover the picture entirely (taking care not to go beyond the outlines) with a slight coat of fixing varnish, then put the picture on the object to be ornamented, being careful to place it properly at once, to avoid spoiling it by moving. The varnish newly applied being too liquid, the picture should be allowed to dry for

about ten minutes, and placed on the object to be ornamented, when just damp enough to be adherent; this done, cover the back of the picture with a piece of cloth steeped in water; then, by means of a knife or penholder, rub it all over, so as to fix every part of it; then remove the piece of cloth and rinse the paper with a paint brush steeped in water; at the end of a few minutes the paper will come off, leaving the painting transferred. Care must be taken that the piece of cloth, without being too wet, is sufficiently so for the paper to be entirely saturated. The picture must now be washed with a wet brush, and dried very lightly with some blotting paper. Keep the ornamented article in a warm, dry place, until dry. The polishing varnish should not be applied until the next day, keeping the pictures meanwhile out of the dust. The latter varnish should be applied as lightly as possible. If dark colored objects are to be ornamented, the picture should first be covered with a mixture of white lead and turpentine, following the outlines of the design, and covering it entirely. When this coat is perfectly dry, proceed as above.

Prints, to Transfer to Glass, Steel, Etc.—To transfer prints to polished steel, or to glass, make a varnish as follows: Gum sandarac, 4 oz.; mastic, 1 oz.; Venice turpentine, 1 oz.; alcohol, 15 oz.; or any smaller quantity in proportion. Digest in a bottle, with frequent shaking. Moisten the print slightly upon the back by laying a wet cloth upon it; then varnish the steel plate or glass with a thin even coat; lay the print with the face next to the varnish, commencing on one side so as not to inclose air bubbles, pressing it down close with the fingers if the print is small, or a soft roller if the print is large. Be careful that all parts of the print are in coutact with the varnish Lay aside to dry. After it is dry, wet the back with water and cautiously rub the paper off with the fingers; rub lightly toward the last with plenty of water, and the surface of the varnish will come up smooth with the ink of the print solidly embedded. Then a thin coat of mastic varnish will give it a finish.

Transferring Prints to Glass.—First coat the glass with dammar varnish or else with Canada balsam mixed with an equal volume of oil of turpentine, and let it dry until it is very sticky, which takes half a day or more. The printed paper to be transferred should be well soaked in soft water and carefully laid upon the prepared glass, after removing surplus water with blotting paper, and pressed upon it, so that no air bubbles or drops of water are seen underneath. This should dry a whole day before it is touched; then with wetted fingers begin to rub off the paper at the back. If this be skillfully done, almost the whole of the paper can be removed, leaving simply the ink upon the varnish. When the paper has been removed, another coat of varnish will serve to make the whole more transparent.—*Nat. Druggist.*

Transferring Writing to Type Metal.—Sprinkle the ink lines, while moist, with gum arabic in finest powder. When perfectly dry dust off excess, stretch the paper on a smooth level backing, and pour on the fusible metal.

Transferring, Varnish for. See **Varnishes.**

Trappistine. See **Liquors.**

Treacle.—The name used by the English to denote molasses.

Trees, Cement for. See **Cements.**

Trees, Fruit.—*Coating for Amputated Branches and Wounds in.*—Shellac, dissolved in alcohol, forms an excellent coating for amputated branches and for wounds of fruit trees, making a water-proof artifical skin, under which the wood grows until the wound is healed. See also **Wax,** *Grafting.*

To Prevent Ants from Injuring.—Make a line of gas tar round the stem of the tree, or if it be trained on a wall, make a horizontal line near the ground on the wall, and one around the stem; this will prevent ants from ascending.

Trees, to Protect, from Mice.—A mixture of tallow, 3 parts; tar, 1 part. Applied to the bark while hot, will protect fruit trees against mice.

Tree Stumps, to Remove. See **Stumps, Removal of.**

Tripe, Curing of.—In New York it is partially parboiled, but in some other places only washed with cold water before sent to market; it is generally cured by pickling in hot vinegar and spices, after cooking.

Tripoli.—The remains of very minute shells, which can be easily seen with the aid of the microscope. Tripoli is used with oil, then dry. It is grayish-yellow in color, and is extensively used to polish the softer metals.

Trituration.—The reduction of friable substances with the pestle. A circular or rotary motion is given to the pestle. Sand is added to reduce resins, but should only be used when the resin is afterward to be gotten into solution.

Trona.—A native sodium carbonate, found on the banks of the Soda lakes, of Sokena, in Africa.

Troy Weight. See **Appendix.**

Tubania. See **Alloys.**

Tubes, Zinc, to Bend.—Solder the joint evenly, and with as little solder as possible; put a cork in one end fill with slightly damp sand, and ram in tight, closing with another cork; heat the tube until just uncomfortably hot to the hand, and then bend round a bit of board sawn to the curve required.

Turbines, the Horse Power of.—The power of water is its weight multiplied by the velocity, and in order to illustrate we will suppose a turbine wheel, working under 15 ft. head, will discharge 3,168 cubic ft. of water per minute, and utilize 80% of the full power of the water. Multiply the cubic ft. discharged per minute by 62½, which is the number of lb. each cubic ft. of water weighs at the average temperature, and this product by height of head under which the wheels are working, and that product divided by 33,000 lb., this number of lb. raised 1 ft. high in one minute being 1 horse power, which will give the full horse power of 3,168 cubic ft. per minute, under 15 ft. head; and as no wheel will produce 100%, the percentage the wheel in question is known to produce or utilize must be taken as the actual horse power, as in the example here given:

3168		cubic ft. per minute.
62½		weight of 1 cubic ft.
1056		
6336		
19008		
197472		full weight of water.
15		ft. head.
987360		
197472		
33000)2962080(	89·76	full value of water.
264000	80%	utilized.
322080	71·8080	net horse power, or 80% of the full power of water.
297000		
250800		
231000		
198000		
198000		

It will be seen that the effective horse power at 80% of the full value of the water is 71·80.

We will now suppose the wheel had only utilized 60%, then multiply the full value, 89·76, by 60, and the horse power would be 54·55. If the wheel would utilize 75%, the effective horse power would be 67·32. From the explanation and example given it can easily be ascertained what number of horse power any wheel will produce with a given number of cubic ft. of water per minute, on any head, provided the percentage the wheel in question will utilize is known.

Turmeric.—The root of a plant (*Curcuma longa*) growing in India, China and Madagascar, and now chiefly cultivated in Bengal. The roots are long and vary in thickness from that of a quill to about half an in. in diameter. They are wrinkled, and have joints or ring-like swellings at short intervals. Outwardly the color is a yellowish gray, while inwardly it is of a deep yellowish brown, darkest in the middle. When reduced to powder it is of a bright yellow. See **Paper,** *Test.*

Turner's Cement. See **Cement.**

Turpentine.—This valuable fluid is the product of several trees, principally *Pinus palustris* and *P. tæda.* Most of it comes from the United States, generally in large barrels, of the consistence of treacle or honey. The oil is obtained by distillation and the remainder is the common resin; sometimes called rosin, which is applied to a variety of uses. There are several kinds of turpentine, viz., Venice turpentine, procured from the *Abies larix,* Strasburg, from *Abies pectinata,* Bordeaux turpentine, from the *Pinus pinaster,* and Chio turps, from the *Pistacia terebinthis.*

Turpentine Chio. (Factitious), Terebinthina Chia Factitia.—Black rosin, 7 lb.; melt, remove the heat, and stir in balsam of Canada, 7 lb. Some add a few drops of the oils of fennel and juniper. This article is now very generally sold in trade for genuine Chia turpentine.

Turpentine, Oil of. See **Oils.**

Turpentine, Venice, Terebinthina Veneta.—Genuine Venice turpentine is the product of the *Larix Europœa,* but this is now scarcely ever met with in trade. That of the shops is wholly a factitious article, made as follows: Black rosin, 48 lb.; melt, remove the heat, and add oil of turpentine, 2 gal.

Tutania. See **Alloys.**

Tutenag. See **Alloys.**

Tutty Powder.—Impure oxide of zinc. A substance which collects in the chimneys of the furnaces in which the ores of zinc are smelted.

Twine, Gloss for.—To 1 lb. starch add (at blood heat) blood albumen, 2 oz.; water glass (syrupy), 2 oz.; curd soap, ¼ oz. (dissolved in warm water). Beat together and let it stand forty-eight hours or more before applying.

Type Metal. See **Alloys.**

Typewriter Ribbons, to Ink. See **Inks.**

Umbrellas, Varnish for. See **Varnishes.**

Umbrellas, to Waterproof. See **Waterproofing.**

Ultramarine, Artificial.—1. Kaolin, 37 parts; sodium sulphate, 15 parts; sodium carbonate, 22 parts; sulphur, 18 parts; charcoal, 8 parts; intimately mix and heat for twenty-four to thirty hours in crucibles; the product is then heated in cast iron boxes, at a moderate temperature, till the required tint is obtained; finally it is pulverized, washed, and dried.

2. Gmelin.—Sulphur, 2 parts; sodium carbonate (dry), 1 part; mix well; gradually heat them in a covered crucible to redness, or till the mixture fuses, then sprinkle in by degrees another mixture of sodium silicate and aluminate of soda (containing 72 parts of silica and 70 parts of alumina), and continue the heat for an hour. The product contains a little free sulphur, which may be separated by water.

3. Robiquet.—By exposing to a low red heat, in a covered crucible, as long as fumes are given off, a mixture of 2 parts pure kaolin and 3 parts each of anhydrous sodium carbonate and sulphur. See also **Pigments.**

Usquebaugh. See **Liquors**

Valence. See **Quantivalence.**

Vanilla Beans, to Pulverize.—Rub well with a little sugar.

Varnishes and Varnishing.—Varnish is a solution of resin in oil, turpentine, or alcohol. The oil dries and the other two solvents evaporate, in either case leaving a solid transparent film of resin over the surface varnished. In estimating the quality of a varnish the following points must be considered:

1. Quickness in drying.
2. Hardness of film or coating.
3. Toughness of film.
4. Amount of gloss.
5. Permanence of gloss of film.
6. Durability on exposure to weather.

The quality of a varnish depends almost entirely upon that of its ingredients; much skill is, however, required in mixing and boiling the ingredients together. Varnish is used to give brilliancy to painted surfaces, and to protect them from the action of the atmosphere, or from slight friction. It is often applied to plain unpainted wood surfaces in the roofs, joinery, and fittings of houses, and to intensify and brighten the ornamental appearance of the grain. Also to painted and to papered walls. In the former case, it is sometimes flatted, so as to give a dead appearance, similar to that of a flatted coat of paint.

Ingredients of Varnish.—Gums are exudations from trees. At first they are generally mixed with some essential oil; they are then soft and viscous, and are known as balsams; the oil evaporates and leaves the resin, which is solid and brittle. Resins are often called gums in practice, but a gum, properly speaking, is soluble in water, and therefore unfit for varnishes, while resins dissolve only in spirits or oil. Gum resins are natural mixtures of gum with resin, and sometimes with essential oil found in the milky juices of plants. When rubbed up with water, the gum is dissolved, and the oil and resin remain suspended.

Solvents must be suited to the description of gum they are to dissolve. Boiling linseed oil (and sometimes other oils, such as rosemary) is used to dissolve amber, gum animi, or copal. Turpentine for mastic, dammar, and common resin. Methylated spirits of wine for lac and sandarac. Wood naphtha is frequently used for cheap varnishes; it dissolves the resins more readily than ordinary spirits of wine, but the varnish is less brilliant, and the smell of the naphtha is very offensive; therefore it is never employed for the best work.

Driers are generally added to varnish in the form of litharge, sugar of lead, or white copperas. Sugar of lead not only hardens, but combines with the varnish. A large proportion of driers injures the durability of the varnish, though it causes it to dry more quickly.

I. For Body and Luster.—

Amber.	Elemi.	Sandarac.
Anime.	Lac.	
Copal.	Mastic.	

II. For Odor.—Benzoin.

III. For Tinctorial Effect.—

Annatto.	Socotrine aloes.	Red sandal wood.
Gamboge.	Turmeric.	Cochineal.
Saffron.	Dragon's blood.	Indigo.

IV. For Color and Body.—asphaltum.

V. For Toughness and Elasticity.—Caoutchouc.

Amber.—1. Amber, 1 lb.; melt, add Scio turpentine, ½ lb.; transparent white resin, 2 oz.;

hot linseed oil, 1 pt.; and afterward oil of turpentine, q. s., as above. Very tough.

2. (Hard.)—Melted amber, 4 oz.; hot boiled oil, 1 qt.; as before.

3. (Pale.)—Very pale and transparent amber, 4 oz.; clarified linseed oil and oil of turpentine, of each 1 pt.; as before.

Amber varnish is suited for all purposes, where a very hard and durable oil varnish is required. The paler kind is superior to copal varnish and is often mixed with the latter to increase its hardness and durability. (See *Amber.*)

4. Varnish, Black. (Black Amber Varnish.)—Amber, 1 lb.; fuse, add hot drying oil, ½ pt.; powdered black rosin and asphaltum (Naples), of each 3oz.; when properly incorporated and considerably cooled, add oil of turpentine, 1 pt. This is the beautiful black varnish of the coachmakers. It is also fit for metals.

5. (Ironwork, Black.)—Asphaltum, 48 lb.; fuse, add boiled oil, 10 gal.; red lead and litharge, of each 7 lb.; dried and powdered white copperas, 3 lb.; boil for two hours, then add dark gum amber (fused), 8 lb.; hot linseed oil, 2 gal.; boil for two hours longer, or till a little of the mass, when cooled, may be rolled into pills; then withdraw the heat, and afterward thin down with oil of turpentine, 30 gal. Used for the ironwork of carriages and other nice purposes.

6. (Black Japan.)—Naples asphaltum, 50 lb.; dark gum anime, 8 lb.; fuse, add linseed oil, 12 gal.; boil, add dark gum amber, 10 lb.; previously fused and boiled with linseed oil, 2 gal.; add the driers and proceed as last. Used for wood or metals.

7. Pale Amber Varnish.—Fuse 6 lb. of fine picked, very pale, transparent amber in the gum pot, and pour in 2 gal. of hot clarified oil. Boil it until it strings very strong. Mix with 4 gal. of turpentine. This will be as fine as body copal, will work free and flow well upon any work it is applied to; it becomes very hard, is durable, and is excellent to mix in copal varnishes, to give them a hard and durable quality. Amber varnish will always require a long time before it is ready for polishing.

8. Tough Amber Varnish.—Amber, 1½ lb.; melt, add Scio turpentine, ¾ lb.; transparent white resin, 3 oz.; hot linseed oil, 1½ pt.; add sufficient oil of turpentine to make of the proper consistency. Very tough.

Aniline Varnishes.—1. These are very useful, as the color is intense, even when in a very thin film. Use alcohol to dissolve the shellac or sandarac. Prepare also an alcoholic solution of the aniline colors; add this to the varnish. Warm the object slightly.

2. Collodion can also be used to carry the aniline colors, and gives a very thin coating.

Aniline Black Varnish.— An aniline black varnish of recent Parisian production is the following: Dissolve 6¾ drm. avoirdupois aniline blue, 1¾ drm. fuchsine, and 4½ drm. naphthaline yellow, in 1 qt. alcohol. The whole is dissolved by agitation in less than twelve hours. One application renders an object ebony black; the varnish can be filtered and will never deposit afterward.

Anti-rust Varnish.—Take the first three ingredients in a pounded condition, and digest them by a regular heat until melted, then add the turpentine very gradually, stirring all the while. Rosin, 120 parts; sandarac, 180 parts; gum lac, 60 parts; essence of turpentine, 120 parts. The mixture should be digested until dissolution, then add rectified alcohol, 180 parts. Filter through fine cloth or thick bibulous papers, and preserve in well stoppered bottles or cases.

Asphalt Varnish.—1. Boil coal tar until it shows a disposition to harden on cooling; this can be ascertained by rubbing a little on a piece of metal. Then add about 30% of lump asphalt, stirring it with the boiling coal tar until all the lumps are melted, when it can be allowed to cool and kept for use. This makes a very bright varnish for sheet metals, and is cheap and durable.

2. Asphalt Varnish for Metals.—Boil ordinary tar until on cooling it shows a tendency to harden, add about ¼ asphaltum shaved fine until all is melted; then cool.

Asphalt Varnish for Microscopists. — (Carpenter.)—Dissolve ½ drm. caoutchouc in mineral naphtha, and then add 4 oz. asphaltum, using heat if necessary.

Balloon Varnish.—1. Good boiled linseed oil, if allowed a sufficient time to dry and harden, forms an excellent varnish for balloon cases.

2. India rubber, 1 lb., cut small; oil of turpentine, 6 lb.; boiled drying oil, 1 gal. Digest the Indian rubber in the turpentine, in a warm place, for a week, frequently shaking the vessel during the whole time, then place it in a water bath and gradually heat it until the solution be completed; next add the oil, previously made warm, gently simmer for five minutes, stirring all the while, after which closely cover it over, and when cold strain it through flannel.

3. Birdlime, 1 lb.; boiled linseed oil, 3 pt.; turpentine, q. s. Boil the birdlime with 1 pt. of the oil in an iron pot, over a slow fire, for about half an hour, or until the former ceases to crackle, then add the rest of the oil, previously heated, and again boiled for one hour, stirring well all the time, being careful that it does not boil over, as it is very liable to do so. When it has boiled sufficiently, may be known by its admitting of being drawn into threads between two knives. As soon as this occurs, remove the pot from the fire, and when cooled a little, add a sufficient quantity of spirits of turpentine, warm, to reduce it to a proper consistence, and work it well up.

These varnishes are better applied lukewarm to the silk, previously stretched out tight. In about twenty-four hours they will dry.

Bamboos, Varnish for.—A varnish prepared by dissolving 3 oz. white shellac in 1 fl. oz. of methylated spirits, applied to the bamboo with a camel's hair brush, will give you a beautiful transparent coating, while showing the natural color of the wood.

Basket Varnish.—

Orange shellac	8 oz.
Yellow resin	1 oz.
Benzoin	½ oz.
Bismarck brown	¼ oz.
Methylated spirit	1½ pt.
Vegetable naphtha	½ pt.

Bessemer's Varnish.—This consists of a pale oil copal varnish, diluted with about six times its volume of oil of turpentine, the mixture being subsequently agitated with about ⅛ part of dry slaked lime, and decanted after a few days' repose. Five parts of the product mixed with 4 parts of bronze powder forms Bessemer's gold paint.

Black Varnish.—1. In an iron pot, over a slow fire, boil 45 lb. of foreign asphaltum for at least six hours, and during the same time boil in another iron pot 6 gal. of oil which has been previously boiled; during the boiling of the 6 gal. introduce 6 lb. of litharge gradually, and boil until it feels stringy between the fingers; then ladle it into the pot containing the boiling asphaltum. Let both boil until, upon trial, it will roll into hard pills; then cool, and mix with 25 gal. of turpentine, or until it is of a proper consistence.

2. Black varnish suitable for covering places where a japanned surface has been injured or scratched: Fine lampblack or ivory black, thoroughly mixed with copal varnish. The black must be in fine powder, and it would mix the more readily if made into a pasty mass with turpentine.

3. Black varnish can be made by putting 48 lb. foreign asphaltum into an iron pot and boiling for four hours; during the first two

hours.introduce 7 lb. of red lead, 7 lb. litharge, 3 lb. dried copperas, and 10 gal. boiled oil; add one 8 lb. run of dark gum with 2 gal. of hot oil. After pouring the oil and gum, continue the boiling two hours, or until it will roll into hard pills like japan. When cool, thin it off with 30 gal. of turpentine or until it is of proper consistence. This varnish is specially adapted for iron work.

4. Black Varnish for Coaches.—

Asphaltum	7½ oz.
Amber	40 oz.
Resin	7½ oz.
Drying linseed oil	1¼ pt.

Melt together in an iron pot. When partly cool, add warm oil of turpentine; 1¼ pt.

5. Black Varnish for Coal Buckets.—

Asphaltum	1½ lb.
Lampblack	⅜ lb.
Resin	¾ lb.
Spirits of turpentine	1½ qt.

Dissolve the resin and asphaltum in the turpentine; form a paste with the lampblack and linseed oil, q. s.; mix with the other. Apply with a brush.

6. Black Japan Varnish.—

Naples asphaltum	50 lb.
Dark gum anime	8 lb.

Fuse, add 12 gal. linseed oil; boil, then add of dark gum amber, 10 lb., previously fused and boiled in 2 gal. linseed oil; next add q. s. of driers and thin with oil of turpentine.

7. Black Varnish for Shoe and Harness Edges.—Cut in.—

Ninety-eight per cent. alcohol	½ pt.
Shellac	1½ oz.
Rosin	1 oz.
Pine turpentine	½ oz.
Lampblack	⅛ oz.

This varnish may also be applied to cloth or wood, where a gloss is desired, after painting.

8. Black Varnish for Straw Hats.—

Best black sealing wax	½ oz.
Rectified 90% alcohol	2 oz.

Powder the sealing wax, and put it with the 90% alcohol in a phial; digest them in a sand bath, or near a fire till the wax is dissolved; lay on warm with a fine, soft hair brush before a fire or in the sun.

9. Black Varnish for Zinc.—Böttger.—Dissolve 2 parts copper nitrate and 3 parts copper chloride (cryst.) in 64 parts water, and add 8 parts nitric acid.

10. Puscher:—Dissolve equal parts of potassium chlorate and copper sulphate in 36 times as much water, warm, and the solution is left to cool Immerse the articles in the solution, and when black, rinse with water and dry.

11. *Brunswick Black.*—Black pitch and gas tar asphaltum, 25 lb. of each; boil gently for five hours, then add 8 gal. linseed oil; litharge and red lead, 10 lb. of each; boil, and when cooled a little, thin with 20 gal. oil of turpentine.

12. Many recipes for making this varnish do not mention the secret, viz., to boil the asphaltum until all the moisture is driven off. Take 7 lb. pitch and 7 lb. asphaltum, boil in an iron pot for seven to ten hours, with frequent stirring. When all moisture is out, add 2 gal. boiled oil, previously heated; then add 2½ lb. red lead and 2½ lb. litharge, and boil for three hours, or until some of it will set hard. Then let it cool down, and add 5 gal. turpentine, or as much as will reduce it to the consistence best suited for your work. This varnish should dry in twenty minutes to one hour, according to the state of the atmosphere. You can try leaving out the red lead, but add the extra in asphaltum, and also vary the quantity of oil. If wanted good and cheap, and twenty-four hours will suit, add more oil, less turps.—*Mayer.*

13. A brilliant black varnish for iron, stone, or wood can be made by thoroughly incorporating ivory black with common shellac varnish The mixture should be laid on very thin. But ordinary coal tar varnish will serve the same purpose in most cases quite as well, and it is not nearly so expensive.

Brilliant Varnish, Soft. — Sandarac, 6 oz.; elemi (genuine), 4 oz.; anime, 1 oz.; camphor, ½ oz.; alcohol, 1 qt.

Body Varnish.—Prep. 1. Finest African copal, 8 lb.; fuse carefully, add clarified oil, 2 gal.; boil gently for four hours and a half, or till quite stringy, cool a little and thin with oil of turpentine, 3½ gal. Dries slowly.

2. Pale gum copal, 8 lb.; clarified oil, 2 gal.; dried sugar of lead, ½ lb.; boil as before, then add oil of turpentine, 3½ gal., and mix it while still hot with the following varnish: 8 lb. pale gum anime; linseed oil, 2 gal.; dried white copperas, ¼ lb.; boil as before and thin with oil of turpentine, 3½ gal.; the mixed varnishes are to be immediately strained into the cans or cistern.

Bookbinder's Varnish. 1. Pale gum sandarac, 3 oz.; alcohol, 20 fl. oz.; dissolve by cold digestion and frequent agitation.

2. Dissolve pale shellac in wood naphtha.

3. Mastic, 6 oz., in drops; 3 oz. coarsely pounded glass, separated from the dust by a sieve; 32 oz. 90% alcohol. Place the ingredients in a sand bath over a fire and let them boil, stirring them well. When thoroughly mixed introduce 3 oz. spirits of turpentine, boil for half an hour, remove from the fire, cool, and strain through cotton cloth.

4. Three pints of 90% alcohol, 8 oz. sandarac, 2 oz. mastic, in drops, 8 oz. shellac, and 2 oz. Venice turpentine. Prepare as for No. 1. Apply lightly on the book with a piece of cotton wool, a small sponge, or a brush.

Varnish, for Bookbinders, Colorless —5. Mr. A. Schmidt gives the following directions for making these and several other beautiful varnishes: For 1½ lb. good shellac take 2 oz. crystallized carbonate of soda and ¾ gal. water; put the whole in a clean iron or copper vessel of double the capacity, and under constant stirring, bring it to boiling over a slow fire. The shellac will dissolve, and if it is intended to make colorless French varnish, the solution has to be run through a woolen cloth. For brown bookbinders' varnish, or a colorless varnish for maps, photographs, etc., the solution has to boil for about an hour longer but only simmering, and then to cool very slowly without stirring; better let it stand overnight, and let the fire go out under it. In the morning a wax like substance will be found on the surface of the solution, and the other impurities of the shellac as a deposit on the bottom of the vessel. The solution is likewise to be run through a woolen cloth and then filtered. To make a transparent brown varnish—bookbinders' varnish—this filtered solution has to be precipitated with diluted sulphuric acid (1 part acid to 20 parts water), the precipitate collected on a coarse muslin cloth, and washed out with cold clear water till it runs through without taste. Then fill a stone or wooden vessel with boiling water, and throw the precipitate in it; it will directly soften and stick together; this half mass has to be kneaded in the hands, doubled up, melted, and drawn out till it assumes a fine silky luster, then drawn out to the desired thickness in sticks, like candy, and it is then ready for solution. To make the bookbinders' varnish, dissolve ½ part of the precipitate in 1½ parts 95% alcohol. To make the colorless varnish, dissolve ⅛ part of the precipitate in the same quantity of alcohol. Add 3 drm. lavender oil to each pint. The colorless varnish will look like whey, but more transparent.

Boots, Varnish for.—There is no waterproof

varnish that does not more or less injure the leather.

Beeswax	18	parts.
Spermaceti	6	parts.
Oil of turpentine	66	parts.
Asphalt varnish	5	parts.
Powdered borax	1	part.
Vine twig, black	5	parts.
Prussian blue	2	parts.
Nitro benzol	1	part.

Melt the wax, add powdered borax, and stir till a kind of jelly has formed. In another pan melt the spermaceti, add the ashpalt varnish, previously mixed with oil of turpentine; stir well, and add the wax. Lastly, add the color, previously rubbed smooth with a little of the wax. Perfume with nitro benzol. Apply in small quantities, wipe with a cloth, and brush.

Bottle Caps, Varnish for.—

Gamboge	2	parts.
Ruby red shellac	2	parts.
Venice turpentine	1	part.
Strong alcohol	20	parts.

Bottles, Varnish, Stoppers for.—Varnish bottles are best closed with stoppers formed of good and pure wax, or corks may be used which have previously been dipped in molten wax. If corks are employed with no wax coating, they very often stick fast in the bottles, and particles are often removed which render the varnish impure.

Brass Colored Varnish.—Dissolve 1 oz. each of pale shellac and gum sandarac in ½ pt. of 90% alcohol.

Bronze for Statuary, Varnish.—Cut best hard soap, 50 parts, into fine shavings; dissolve in 2 parts water; add solution blue vitriol, 15 parts in water, 60 parts; wash with water, dry slow. Dissolve in turpentine.

Bronze Varnish for Small Castings.—Ten parts diamond fuchsin and 5 parts Hofmann's methyl violet are dissolved in water or sand bath in 100 parts alcohol of 95%; then add 5 parts benzoic acid, and boil from 5 to 10 minutes, until the whole has acquired a brilliant bronze color. This varnish adheres firmly to all articles, possesses a beautiful gloss, and is very durable.

Brown Hard Spirit Varnish.—1. Sandarac, 4 oz.; pale seed lac, 2 oz.. elemi, 1 oz.; alcohol, 1 qt.; digest with agitation till dissolved, then add Venice turpentine, 2 oz.

2. Gum sandarac, 3 lb.; shellac, 2 lb.; rectified spirit (65 over proof), 2 gal.; dissolve, add turpentine varnish, 1 qt.; agitate well and strain. Very fine.

3. Seed lac and yellow resin, of each 1½ lb.; rectified spirit, 2 gal.

4. Gum juniper, 6 oz.; shellac, 6 oz.; salt of tartar, ½ oz.; Venice turpentine, 1½ oz.; and 4 pt. of 90% alcohol, mixed together.

Cabinet Makers' Varnish.—Very pale shellac, 5 lb.; mastic, 7 oz.; alcohol, of 90%, 5 or 6 pt.; dissolve in the cold with frequent stirring. Used for French polishing, etc. It is always opaque. A similar varnish, made with weaker spirit, is used by bookbinders to varnish morocco leather book covers.

Carriage Varnish, Best Pale.—Eight lb. of second sorted African copal, 2½ gal. of clarified oil; boil till very stringy. One fourth lb. of dried copperas, ¼ lb. of litharge, 5½ gal. of turpentine; strained. Eight lb. of second sorted gum anime, 2½ gal. of clarified oil. ¼ lb. of dried sugar of lead, ¼ lb. of litharge, 5½ gal. of turpentine; mix with the first while hot. This varnish will dry hard, if well boiled, in four hours in summer and six in winter. As its name denotes, this is intended for the varnishing of the wheels, springs, and carriage parts of coaches, chaises, etc.; also it is that description of varnish which is generally sold to and used by house painters and decorators, as from its drying quality and strong gloss it suits their general purposes well.

Second Carriage Varnish.—Eight lb. second sorted gum anime, 2¾ gal. of fine clarified oil, 5¼ gal. of turpentine, ¼ lb. of litharge, ¼ lb. of dried sugar of lead, ¼ lb. of dried copperas; boil and mix as before. When three runs are poured into the boiling pot, the regular proportion of driers put in, and well boiled, this varnish will dry hard and firm in four hours in winter, and in two in summer; it is principally intended for varnishing dark carriage work or black japan, and is also used by house painters for dark work.

Quick Drying Carriage Varnish.—Eight lb. of fine pale gum anime, 2 gal. of clarified oil, 3½ gal. of turpentine; to be boiled four hours. This, after being strained, is put into the two former pots, and well mixed together; its effect is to cause the whole to dry quicker and firmer, and enable it to take the polish much sooner.

Canada Balsam Varnish.—Ground Glass, to Render Transparent.—Take 4 oz. Canada balsam and bake in oven until quite brittle when cooled Dissolve this in 12 oz. benzole in which 12 oz. mastic has been previously dissolved.

Changing Varnish.—To Imitate Gold or Silver. —Put 5 oz. gum gamboge in 40 oz. spirits of turpentine; 1¼ oz. annatto into 10 oz. spirits turpentine; 5 oz. dragon's blood into 40 oz. spirits of turpentine; make the 3 mixtures in separate vessels. The mixtures must be kept in a warm place and exposed to the sunlight for 2 or 3 weeks. Add together such quantities of each mixture as will produce the desired color.

Chimneys and Stove Pipes, Varnish for.—Asphaltum 2 lo., boiled linseed oil 1 pt., oil of turpentine 2 qt. Fuse the asphaltum in an iron pot, boil the linseed oil, and add while hot. Stir well and remove from the fire. When partially cooled add the oil of turpentine.

Chinese.—1. Disolve 1 part of shellac and a small piece of camphor in 15 parts alcohol. Let the bottle remain in the sun for 2 days, shaking frequently; then strain. After standing, pour off the clear portion. 2. Two oz. mastic and gum sandarac; 20 fl. oz. strong alcohol; dissolve. Dries in six minutes.

Collodion.—Add 1 oz. castor oil to 1 qt. collodion. This is a very useful varnish for varnishing maps, etc.

Colorless Varnish, Luning's.—Dissolve 2½ oz. of shellac in 1 pt. 90% alcohol, boil a few minutes with 5 oz. of well-burnt and recently heated animal charcoal. A small portion of the solution should then be filtered, and if not colorless, more charcoal must be added. When all color is removed press the liquor through a piece of silk, and afterward filter through fine blotting paper. This kind of varnish should be used in a room at least 60° F., perfectly free from dust. It dries in a few minutes, and is not liable afterward to chill or bloom. It is particularly applicable to drawings and prints that have been sized, and may be advantageously used upon oil paintings which are thoroughly hard and dry, as it brings out the colors with the purest effect. This quality prevents it from obscuring gilding, and renders it a valuable varnish for all kinds of leather, as it does not yield to the warmth of the hand and resists damp, which subjects leather to mildew. Its useful applications are very numerous, indeed to all the purposes of the best hard spirit varnish.

Colorless Varnish for Leather.—Pale shellac, 5 oz.; borax, 1 oz.; water, 1 pt.; digest nearly at the boiling point, until dissolved, then strain.

Colpins' India Rubber Varnish.—Fuse India rubber in a closed vessel for about 3 hours. Then remove and stir for about 10 minutes, close and repeat the operation each day until small bubbles appear on the surface; then strain.

Common Work, Varnish for.—This varnish is intended for protecting surfaces against atmospheric exposure. It has been used for coating wood and iron work with great advantage.

Take 3 lb. of resin and powder it, place it in a tin can, and add ½ pt. of spirits of turpentine, well shake, and let it stand, occasionally shaking it for a day or two. Then add of boiled oil 5 qt., well shake altogether, and allow it to stand in a warm room till clear. The clear portion is decanted and used, or reduced with spirits of turpentine until of the proper consistency.

Common Varnish.—Digest shellac, 1 part, with alcohol, 7 or 8 parts.

Composition Varnish.—Gum copal, 90 lb.; alcohol, 9 gal.; benzine, 10 gal.; and, by process of churning, amalgamate them into varnish. Then take gum gamboge, 6 lb.; orange aniline, 6 oz.; alcohol, 1 gal. When this mixture is thoroughly dissolved, filter it into the varnish and mix well together. This composition of materials secures a compound which, in cheapness, hardness of surface obtained by its application, and in its adaptability for protecting and embellishing the surface of walnut and other woods, is a valuable substitute for gum shellac varnish. The color may be changed by using for orange a different shade of aniline.—*Mayer and Lowenstein.*

Confectionery, Varnish for.—Take ½ lb. or more of gum benzoine, put it into a bottle and cover it with fourth proof alcohol, cork up tightly and let it digest for at least two weeks, shaking up once or twice a day. After which time you may pour gently off any quantity you may require for present use. It should be the thickness of thin syrup; if used too thick, it is apt to appear in streaks on the work when dry; if too thick, dilute it with alcohol. This varnish is perfectly harmless and very fragrant, resembling somewhat the odor of vanilla. It will also keep for years, growing better with age. It is a nice varnish for all kinds of chocolate work and candies, pulled and clear. It forms, when dry, a thin glossy film or skin over them, which prevents the access of the moisture of the surrounding atmosphere, and tends to keep them from becoming sticky for a much longer period of time.—*British Confectioner.*

Copal Varnish, Quick Drying.—Eight lb. best African copal, 2 gal. clarified oil, ¼ lb. dried sugar of lead, 3½ gal. turpentine, boiled till stringy, and mixed and strained; 8 lb. fine gum anime, 2 gal. clarified oil, ¼ lb. white copperas, 3½ gal. turpentine; boiled as before; to be mixed, and strained while hot, into the other pot. These two pots mixed together will dry in six hours in winter and in four in summer; it is very useful for varnishing old work, on dark colors.

White Copal Varnish.—

Copal	4 oz.
Camphor	½ oz.
White drying oil	3 oz.
Essential oil of turpentine	2 oz.

Reduce the copal to powder, mix the camphor and drying oil, then heat on a slow fire, and add the oil of turpentine, and strain.

Copal Varnish.—Dissolve 1 part of camphor in 12 parts (by weight) of ether; to the solution add 4 parts of clear copal, previously powdered fine. Leave the mixture in a moderately warm place in a well-stoppered bottle, frequently agitating until the copal is partially dissolved. Then add 4 parts of absolute alcohol and ¼ of a part of essence of turpentine. The result should be a viscid liquid, almost homogeneous. If this be set aside for a few days it will separate into two layers, the lower of which contains the most copal, but the higher stratum will be found to give the most brilliant varnish, although it is at the same time as limpid water.

Copal Varnish with Ammonia.—Grind copal to a course powder and pour ammonia over it until the whole mass is swelled up. Heat this to about 100° F., then add alcohol until the mixture is of the desired consistency.

Best Body Copal Varnish for Coach Makers.—Fuse 8 lb. of fine African gum copal; add 2 gal. of clarified oil; boil very slowly for 4 or 5 hours, until quite stringy; mix off with 3 gal. of turpentine; strain off, and pour it into a cistern.

Varnish, Copal.—1. Turpentine.—Oil of turpentine, 1 pt.; set the bottle in a water bath, and add in small portions at a time, 3 oz. of powdered copal that has been previously melted by a gentle heat, and dropped into water; in a few days decant the clear. Dries slowly, but is very pale and durable. Used for pictures, etc.

2. Oil.—Pale hard copal, 2 lb.; fuse, add hot drying oil, 1 pt.; boil as before directed, and thin with oil of turpentine, 3 pt., 12 oz., or q. s.

3. Clearest and palest African copal, 8 lb.; fuse, add hot and pale drying oil, 2 gal.; boil till it strings strongly, cool a little, and thin with hot rectified oil of turpentine 3 gal., and immediately strain into the store can. Very fine. Both the above are used for pictures.

4. Spirit.—Coarsely powdered copal and glass, of each 4 oz.; alcohol, of 90%, 1 pt.; camphor, ½ oz.; heat it in a water bath so that the bubbles may be counted as they rise, observing frequently to stir the mixture; when cold decant the clear. Used for pictures.

5. Copal melted and dropped into water, 3 oz.; gum sandarac, 6 oz.; mastic and Chio turpentine, of each 2½ oz.; powdered glass, 4 oz.; alcohol, of 85%, 1 qt.; dissolve by a gentle heat. Used for metal chairs, etc.

Copal Varnish (Spirit).—1. Melt in an iron pan at a slow heat, copal gum, powdered, 8 parts, and add balsam capivi, previously warmed, 2 parts. Then remove from the fire, and add spirits of turpentine, also warmed beforehand, 10 parts, to give the necessary consistence. Gum copal is made more soluble in spirits of turpentine by melting the powdered crude gum, and allowing it to stand for some time loosely covered.

2. Pounded copal, 24 parts; spirits of turpentine, 40 parts; camphor, 1 part.

3. Copal in powder, 16 parts; camphor, 2 parts; oil of lavender, 90 parts. Dissolve the camphor in the oil, heat the latter, and stir in the copal in successive portions until complete solution takes place. Thin with sufficient turpentine to make it of proper consistence.

Cotton Cloth, Varnish for (so that it can be written on).—Apply to the fabric a preparation of gum (gum arabic and water) and allow it to dry, then press the place with a moderately hot iron. If the fabric is glazed or starchy, it is best to wash out the starch before applying the preparation.

Crystal Varnish.—1. Genuine pale Canada balsam and rectified oil of turpentine, equal parts; mix, place the bottle in warm water, agitate well, set it aside, in a moderately warm place, and in a week pour off the clear. Used for maps, prints, drawings, and other articles of paper, and also to prepare tracing paper and to transfer engravings.

2. Mastic, 3 oz.; alcohol, 1 pt.; dissolve. Used to fix pencil drawings.

Dammar Varnish.—Gum dammar, 10 parts; gum sandarac, 5 parts; gum mastic, 1 part. Digest at a low heat, occasionally shaking, with spirits of turpentine, 20 parts. Add spirits of turpentine until of the consistence of syrup.

Dark Varnish for Light Woodwork.—Pound up and digest shellac, 16 parts; gum sandarac, 32 parts; gum mastic, 8 parts; gum elemi, 8 parts; dragon's blood, 4 parts; annatto, 1 part; with white turpentine, 16 parts; and alcohol, 256 parts. Dilute with alcohol if required.

Davies' Varnish.—India rubber shreds, 30 grn.; Egyptian asphaltum, 4 oz.; solvent naphtha (mineral), 10 oz. Dissolve the India rubber in the naphtha, then add asphaltum, use heat if necessary, but look out for fire, better use a water bath.

Dead Surface Varnish.—Varnishes that leave

a dead surface on drying, capable of substitution for ground glass, as for glass stereographs, and of use in retouching negatives, may be made by mixing solutions of resine with liquids in which they are insoluble. A solution of sandarac resin in ether, when mixed with one fourth as much benzole, affords an excellent imitation of ground glass; one of dammar resin in benzole, when mixed with ether, also gives a good dead surface; water instead of the ether renders it, at the same time, semi-opaque. A mixture of benzole with common negative varnish frequently, but not always, gives a beautiful dead surface. In all cases a great deal depends on the purity of the ingredients. It is recommended to dissolve from 3 to 5 parts of sandarac in 48 parts of ether, and to add 24 parts of benzole; or as much as may be necessary to produce the desired result. The following, by Hughes, is said to give a perfectly colorless varnish of this kind: Ether, 560 grn.; benzole, 240 grn.; sandarac, 40 grn; Canada balsam, 10 grn.; the resins are first to be dissolved in the ether, and the benzole added to the solution.

Drawings, Varnish for.—1. Put a drop or two of acetic acid in the ink, and when the drawing is dry varnish with mastic varnish.

2. Boil parchment cuttings until a size is produced.

Dry Plates (Ashman's), Varnish for.—

Commercial japanner's gold size.	2	parts.
Refined benzole	2	parts.

This should be applied when the plate is thoroughly dry but not warm. Drain off the excess of varnish and let the plate dry overnight. See also *Negative Varnishes*, below.

Dull Varnish.—A varnish which does not reflect light is prepared by mixing a solution of resin with some liquid in which resin is insoluble. A mixture of 3 to 5 parts of sandarac dissolved in 48 parts of ether and 2½ parts of benzole resembles ground glass when dry. A solution of dammar resin in benzol mixed with ether gives a good dull varnish. Water renders the varnish semi-opaque. Hughes recommends the following receipt:

Ether	560	grm.
Benzol	240	grm.
Sandarac	40	grm.
Canada balsam	10	grm.

—*Science Record*, 1874.

Earthenware, Varnish for.—Equal parts pulverized glass and soda are mixed. The mixture is then dried over a good fire and spread upon burnt vessels while they are still hot.

Electrical Varnish.—A varnish formed by dissolving orange shellac in 95% alcohol is indispensable for all kinds of electrical work, and for finishing wood and metal work. It may be readily colored by the addition of pigments. For brown the red and black may be mixed; for purple the red and blue; for yellow, finely powdered yellow ocher or chrome yellow may be added; for a dead black varnish, alcohol, with a small percentage of shellac varnish added, mixed with calcined lampblack, answers an excellent purpose.

Engraving on Copper, Varnish for.—

Yellow wax	1	oz.
Mastic	1	oz.
Asphaltum	½	oz.

Melt, pour into water and form into balls for use. A softer varnish for engravers is made with—

Tallow	1	part.
Yellow wax	2	parts.

Or—

Wax	2	oz.
Common turpentine	1	drm.
Olive oil	1	drm.

Engraver's Stopping-Out Varnish.—Take lampblack and turpentine to make a paste.

Engraving on Glass, Varnish for.—

1. Wax	1	oz.
Mastic	½	oz.
Asphaltum	¼	oz.
Turpentine	½	drm.
2. Mastic	15	parts.
Turpentine	7	parts.
Oil of spike	4	parts.
3. Asphaltum	1	oz.
Wax	4	oz.
Mastic	2	oz.
Turpentine	2	drm.

Engravings and Drawings, to Varnish.—Size with weak isinglass size (1 oz. to the pint of water), give 2 coats, then varnish with mastic varnish.

Etching Varnish (Lawrence).—

1. White wax	2	oz.
Black pitch	½	oz.
Burgundy pitch	½	oz.

Melt together by degrees powdered asphaltum, 2 oz., and boil till a drop taken out on a plate will break when cold by being bent double two or three times between the fingers; it must then be poured into warm water and made into small balls for use.

2. Callot's and Florentine Hard Varnish.—

Linseed oil	4	oz.
Mastic	4	oz.

Melt together.

3. Callot's Soft Varnish.—

Linseed oil	4	oz.
Gum benzoin	½	oz.
White wax	½	oz.

Boil to ⅝.

Fans, Varnish for.—Fifteen parts mastic are dissolved with 40 parts sandarac in 250 parts of alcohol, and 20 parts of Venice turpentine are added.

Ferrotype Varnish.—A varnish may be made as follows:

Alcohol (95% strong)	50 parts.
White shellac	12 parts.

To which add a few drops of oil of lavender.

Finishing Varnish, to Harden.—A newly varnished carriage is liable to spot. To prevent this, some wash the carriage two or three times in clean cold water, applied with a sponge instead of using a hose; this will help harden the surface and prevent it, to some extent, from being injured by the mud or water getting splashed on the job. Never let mud dry on the surface, and then wash off expecting to see no spots on the varnish. You will certainly be disappointed, and the only way to remedy the evil will be to have it revarnished. Soft water is better than hard water for the washing of carriages, as the lime which is in the hard water is very liable to injure the varnish.

Flanders Varnish.—Dissolve grain mastic in alcohol; this operation is requisite to detach the impurities in the resin. The proportion of spirit ought to be sufficient to cover the mastic, and ¼ part more.

Flexible Varnish.—See also *Balloon Varnish* and *India Rubber Varnish.*

1. India rubber (cut small), 1½ oz.; 20 fl. oz. chloroform, ether, or carbon bisulphide; digest without heat until the solution is complete.

2. Same, only substituting gutta percha for India rubber.

3. Dissolve 1 oz. India rubber in 1 pt. benzol by digesting with gentle heat. This varnish dries badly.

4. Linseed oil, 1 gal.; 3 oz. each crude zinc sulphate and lead acetate; 8 oz. litharge; boil with constant agitation until it strings well, then cool slowly, and decant the cool portion. If too thick, thin with quick-drying linseed oil. Use great caution in preparing all varnishes which require the use of such inflammable materials as carbon bisulphide.

5. Pure Indian rubbber in shavings, 1 oz.; mineral naphtha, 2 lb.; digest at a gentle heat in a close vessel till dissolved, and strain.

6. Indian rubber, 1 oz.; drying oil, 1 qt.; dissolve by as little heat as possible, employing constant stirring, then strain.

7. Linseed oil, 1 gal.; dried white copperas and sugar of lead, of each 3 oz.; litharge, 8 oz.; boil with constant agitation till it strings well, then cool slowly and decant the clear. If too thick, thin it with quick-drying linseed oil. The above are used for balloons, gas bags, etc.

Flowers, Varnish for.—The following varnish is recommended for coating the stalks of flowers for the preservation of their color and general character:

Isinglass	11	oz.
Concentrated glycerine	9	oz.

The isinglass to be softened by first soaking it in cold water, and then dissolved in the glycerine by digestion and agitation with the latter heated to 212° Fah. over a water bath. When properly prepared this varnish is colorless, and when cold resembles rubber in all but color. Another varnish recommended for this purpose is prepared from—

Bleached gutta percha	1	oz.
Deodorized benzole	7	oz.

The gutta percha is cut into fine shreds and gradually added to and agitated with the solvent kept hot or (warm) over a sand bath—away from fire. The whole flower may be dipped into this varnish, shaken, and exposed to the air to dry. Another preparation suggested for this purpose is plain collodion diluted ⅛ and mixed with 2% of camphor, also dissolved in a small quantity of ether and alcohol.

Gilt Articles, Varnish for.—Gum lac, 125 parts; gamboge, 125 parts; dragon's blood, 125 parts; annatto, 125 parts; saffron, 32 parts. Dissolve each resin in 1,000 parts, by measure, of absolute alcohol; 2 separate mixtures must be made with the dragon's blood and annatto, in 1,000 parts of such alcohol; and a proper proportion of each should be added with the gamboge to the varnish, according to the shade of color required.

Varnish for Imitating Gilding.—A very perfect imitation of gilding on brass and bronze articles, it is said, may be made by means of a varnish composed of 80 grn. of gum lac, 20 grn. of dragon's blood, 5 grn. of turmeric, and 1,660 grn. of acohol. The metal should be brushed with the varnish in all directions, by means of a sponge, and then immediately warmed over a gentle charcoal fire. The surface at first will appear dead, but will soon resemble the finest gilding. The varnish should be kept in well-corked bottles.

Glass, Varnish for.—1. Dissolve tragacanth in white of an egg beaten up to a froth. Allow it to stand for 24 hours.

2. Pulverize a quantity of gum adragant, and let it dissolve for 24 hours in the white of eggs, well beaten up; then rub it gently on the glass with a soft brush. Not recommended.

Glass Varnish.—1. A name applied to a solution of sodium silicate, or water glass.

2. Fuse together 15 parts of powdered quartz (or of fine sand), 10 parts of potash, and 1 of charcoal. Pulverize the mass, and expose it for some days to the air; treat the whole with cold water, which removes the foreign salts, etc. Boil the residue in 5 parts of water until it dissolves. It is permanent in the air, and not dissolved by cold water. Used to protect wood, etc., from fire.

Globes, Varnishing.—Varnish them with white hard varnish. It would be advisable to touch the chafed places up first with a little gum water, in which a little sugar candy is put, before revarnishing, to keep the paper from absorbing the varnish.

1. *Gold Varnish.*—

Shellac	16	parts.
Gum sandarac	3	parts.
Mastic	3	parts.
Crocus	1	part.
Gum gamboge	2	parts.

All bruised, with alcohol, 144.

2.

Seed lac	8	parts.
Sandarac	8	parts.
Mastic	8	parts.
Gamboge	2	parts.
Dragon's blood	1	part.
White turpentine	6	parts.
Turmeric	4	parts.

Bruised, with alcohol, 120.

3.

Turmeric	1	drm.
Gamboge	1	drm.
Oil turpentine	2	pt.
Shellac	5	oz.
Sandarac	5	oz.
Dragon's blood	7	drm.
Thin mastic varnish	8	oz.

Digest with occasional agitation, for fourteen days, in a warm place, then set aside to fine, and pour off the clear.

4. Pulverize 1 drm. of saffron and ½ drm. of dragon's blood, and put them into 1 pt. 90% alcohol; add 2 oz. of gum shellac and 2 drm. of socotrine aloes; dissolve the whole by gentle heat. Yellow painted work varnished with this mixture will appear almost equal to gold.

Gold Frames, Varnish for Restoring Whitened Gilt.—Reduce 30 grn. gamboge and ½ oz. dragon's blood to coarse powder, and add to 3 grn. turmeric powder, and 2½ oz. each of shellac and sandarac. Place in a bottle with 1 pt. turpentine, and, keeping it in a warm place for 14 days, shake at intervals, filter, and add 4 oz. mastic varnish. This is to be applied with a brush to metal coated frames.

Greenhouses, Varnish for.—Mix together 6 oz. finely grated cheese, 3 oz. slaked lime, and 6 oz. boiled linseed oil. Mix, and gradually add 6 oz. each of the whites and yelks of eggs; liquefy this mixture by heat. Though the ingredients of this varnish are somewhat peculiar, it is said to produce an excellent transparent varnish.

Ground Glass Varnish.—

Sandarac	90	grn.
Mastic	20	grn.
Ether	2	oz.
Benzole	½ to 1½	oz.

The proportion of the benzole added determines the nature of the matt obtained.

Guaiacum Varnish.—Gum guaiacum, 2 oz.; shellac, 2 oz.; methylated spirit, 10 oz. Powder the gum, dissolve in the spirit, filter, add the shellac. Keep in jar surrounded by warm water until dissolved.

Gun Barrels, Varnishes for.—To make a good varnish for gun barrels, take—

Shellac	1½	oz.
Dragon's blood	3	drm.
Rectified spirit	1	qt.

Apply after the barrels are browned.

Gun Stocks, Varnish for.—Five oz. shellac, ½ oz. sandarac, Venice turpentine, 1 drm.; alcohol, 2 qt.

Gutta Percha Varnish.—Clean ¼ lb. gutta percha in warm water from adhering impurities, dry well, dissolve in 1 lb. rectified resin oil, and add 2 lb. linseed oil varnish, boiling hot.

Hats (Straw), Varnish for.—Dissolve 1 oz. sealing wax in 4 oz. strong alcohol. Digest with heat over a sand bath.

Hair Varnish.—One part fine chopped hog's bristles, drying oil, 10 parts; dissolve by heat. Used to give the appearance of horse hair to cloth.

Hare's Colorless, for Photographs.—Dissolve shellac by the aid of heat in 8 parts water and 1 part pearlash. Precipitate by chlorine and dissolve in alcohol.

Harness Varnish.—1. Isinglass, 1 oz.; indigo, 1

oz.; logwood, 1 lb.; best glue, 1 lb.; soft soap, 8 oz.; vinegar, 2 qt.; mix by heat and strain.

2. Alcohol, 2 gal.; white turpentine, 3 lb.; shellac, 3 lb.; Venice turpentine, ½ pt. When the resins are all dissolved, add a little olive oil, and color, if desired, with lampblack.

Frames, Varnishing of.—

Ninety per cent alcohol	1	pt.
Sandarac	2	oz.
Mastic (in drops)	1	oz.
Shellac	2	oz.
Venice turpentine	¾	oz.

Place the ingredients on sand bath, let boil, stirring well. When well mixed, add 1 oz. spirits of turpentine, boil ½ hour, let cool, and strain through cotton cloth, applying the same to frame with a brush.

Frames, Dead Ground Varnish for Imitation, etc.—Dissolve 1 lb. of shellac in a little alcohol, and 1 lb. of whiting and enough alcohol to make 1 gal. of varnish.

Frames for Hot-Be s.—

Pulverized white cheese	4	oz.
Slaked lime	2	oz.
Boiled linseed oil	4	oz.

Mix, and add 4 oz. each of whites and yelks of eggs, and liquefy the mixture by heat. This curious mixture is said to produce a pliable and transparent varnish.

Furniture Varnish.—

1. White wax	6	oz.
Oil of turpentine	1	pt.

Dissolve by a gentle heat. Used to polish wood by friction. See Cabinet Makers' and Copal Varnishes.

2. Shellac, 1½ lb.; naphtha, 1 gal.; dissolve, and it is ready without filtering.

3. Shellac, 12 oz.; copal, 3 oz. (or an equivalent of varnish); dissolve in 1 gal. of naphtha.

4. Shellac	1½	lb.
Seed lac	4	oz.
Sandarac	4	oz.
Mastic	2	oz.
Ninety per cent alcohol	1	gal.

Dissolve.

5. Shellac	2	lb.
Benzoin	4	oz.
Spirit	1	gal.
6. Shellac	10	oz.
Seed lac	6	oz.
Sandarac	6	oz.
Copal varnish	6	oz.
Benzoin	3	oz.
Naphtha	1	gal.

To darken, benzoin and dragon's blood are used; turmeric and other coloring matters are also added; and to make it lighter it is necessary to use bleached l c, though some endeavor to give this effect by adding oxalic acid to the ingredients: it, like gum arabic, is insoluble in good spirit or naphtha. For all ordinary purposes the first form is best and least troublesome, while its appearance is equal to any other.

White Furniture Varnish—White wax, 6 oz.; oil of turpentine, 1 pt.; dissolve by a gentle heat. Or white wax, 6 parts; petroleum, 48 parts; applied to the work while warm, allowed to cool, then polished by rubbing with a coarse cloth.

Furniture, to Varnish.—First make the work quite clean; then fill up all knots or blemishes with cement of the same color; see that the brush is clean, and free from loose hairs; then dip the brush in the varnish, stroke it along the wire raised across the top of the varnish pot, and give the work a thin and regular coat; soon after that another, and another, always taking care not to pass the brush twice in the same place; let it stand to dry in a moderately warm place, that the varnish may not chill. When the work has had about 6 or 7 coats, let it get quite hard (which prove by pressing the knuckles on it; if it leaves a mark, it is not hard enough); then with the first three fingers of the hand rub the varnish till it chafes, and proceed over that part of the work intended to be polished, in order to take out all the streaks or partial lumps made by the brush; then give it another coat, and let it stand a day or two to harden.

Impermeable Varnish.—Boiled oil, 180 parts; finely powdered litharge, 6 parts; genuine beeswax, 5 parts. Boil until sufficiently thick and stringy, then pour off the clear.

See *Waterproof* Varnishes below.

India Rubber Varnish.—1. Two oz. India rubber finely divided, placed in a phial and digested in a sand bath, with ¼ lb. of camphene and ¼ oz. of naphtha. When dissolved add 1 oz. of copal varnish, which renders it more durable.

2 Digest in a wide mouthed glass bottle 2 oz. of India rubber in shavings, with 1 lb. of oil of turpentine, during two days, without shaking; then stir up with a wooden spitula. Add another pound of oil of turpentine, and digest, with frequent agitation, until all is dissolved. Mix 1½ lb. of this solution with 2 lb. of white copal oil varnish, and 1½ lb. of boiled linseed oil; shake and digest in a sand bath until they have united into a good varnish.

3. Four oz. India rubber in fine shavings dissolved in a covered jar by means of a sand bath in 2 lb. of crude benzole, and then mixed with 4 lb. of hot linseed oil varnish and ½ lb. of oil of turpentine. Dries well.

Inflexible.—Shellac, 4 oz.; wood naphtha, 1 pt.; lampblack q. s to color; dissolve.

Insulating Varnishes.—1. Put 1 oz. shellac into a wide mouthed 8 oz. phial containing 5 oz. of well rectified wood naphtha. Close the bottle with a cork, and let it stand in a warm place until perfectly dissolved. Shake the mixture frequently and pass the fluid through a paper filter; add rectified naphtha to the solution from time to time in such quantities as will enable it to percolate freely through the filter. Change the filter when necessary.

2. For Silk Covered Wire.—Mix 6 oz. boiled linseed oil and 2 oz. rectified spirits of turpentine.

3. For Large Coils.—Cotton covered wires are steeped in melted paraffine, to increase their insulation. Large electro magnet coils have a double covering of cotton, and the outer layer is coated with a thick varnish of shellac dissolved in alcohol.

Red Varnish for Wood, etc.—Sealing wax dissolved in alcohol, and painted on with a brush, in successive thin layers, say four or five.

For Galvanometer Coils.—Gum copal dissolved in ether, painted over each layer of wire, and dried on a stove.

Iron Work, Varnish for.—Dissolve in about 2 lb. tar oil, ½ lb. asphaltum, and a like quantity of pounded resin, mix hot in an iron kettle, care being taken to prevent any contact with the flame. When cold the varnish is ready for use. This varnish is for outdoor wood and iron work.

Iron Work, Black.—Put 48 lb. of foreign asphaltum into an iron pot, and boil for four hours; during the first two hours introduce 7 lb. of red lead, 7 lb. of litharge, 3 lb. of dried copperas, and 10 gal. of boiled oil; add ½ lb. run of dark gum, with 2 gal. hot oil. After pouring the oil and gum, continue the boiling two hours, or until it will roll into hard pills, like japan. When cool, thin it off with 30 gal. of turpentine, or until it is of a proper consistence.

Italian Varnish.—1. Boil Scio turpentine till brittle, powder, and dissolve in oil of turpentine.

2. Canada balsam and clear white rosin, of each 6 oz.: oil of turpentine, 1 qt.; dissolve. Used for prints, etc.

Iron and Steel, Black Varnish for.—Boil sulphur in turpentine, apply with a brush and

after heating, the iron becomes of an intense and brilliant black.

Japan Varnish.—Take 12 lb. Naples asphaltum and 2 lb. dark gum anime, melt it, and boil for two hours with 3 gal. linseed oil. Then boil 2 lb. dark amber with ½ gal. linseed oil, add the two together, and boil two hours longer, till the mass when cooled is plastic like putty. This is afterward dissolved in 7 or 8 gal. of turpentine, and makes a black japan for wood or metal. See **Japanning.**

Japanese.—1. Fifteen parts of copal and 1 part of camphor are dissolved in 60 parts oil of turpentine and 15 parts oil of lavender are gradually added.

2. Japanese Varnish, Black.—One part of asphaltum is dissolved in 50 parts boiled oil, and 2 parts burnt umber are added. Dissolve the asphaltum in a portion of the oil, then add the umber, which has been previously ground, in the oil; add the remainder of the oil and cool; thin with oil of turpentine.

3. Twenty-five parts of shellac are dissolved in 100 parts wood alcohol.

4. Kirstein.—

Mastic	10 parts.
Oil of lavender	4 parts.
Camphor	½ part.
Sandarac	26½ parts.
Venice turpentine	2 parts.
Ether	3 parts.
Alcohol	20 parts.

By weight. The ingredients should be macerated for two or three weeks, or until they are all dissolved. This varnish dries quickly, and is colorless, smooth and shining.

Labels, Varnish for.—1. Dissolve 1 oz. camphor, 2 oz. resin, 4 oz. sandarac, in 24 oz. alcohol.

2. A very satisfactory varnish is made with equal parts of Canada balsam and turpentine. The labels should first receive a thin coating of mucilage, which must be dried before the varnish is applied.

3. Sardarac. 53 parts.
Mastic 22 parts.
Camphor 1 part.
Lavender oil 8 parts.
Venice turpentine 4 parts.
Ether 6 parts.
Alcohol 40 parts.
All by weight.

Macerate the ingredients for several weeks until fully dissolved. The result is a limpid, colorless, brilliant varnish, which dries quickly and is not too brittle.—*Arch. de Pharm.*

4. African copal 60 grm.
Powdered glass 60 grm.
Camphor 15 grm.
Ether 250 grm.
Absolute alcohol 60 grm.

Reduce the copal to fine powder, and mix the glass with it; place both in a 500 grm. bottle with the camphor and the ether, close well, and set aside for a month, shaking occasionally. At the end of this time add the alcohol, and, after shaking well, set aside for fourteen days; then pour off the clear portion of the varnish. Before using this varnish it is advisable to size the paper surface with a solution of isinglass in spirit, 1 part, and water, 3 parts.

5. The best varnish for labels is simply melted paraffin. Use it as hot as possible, so as to apply only a very thin coat by means of a flat fine brush. It may be well to place the bottles before on a warm place. In place of having to wait several hours or a day to dry, as with other varnishes, this application is dry when cold, thus in a minute or so, and the bottle ready for use.

Lac Varnish.—1. Seed lac, 8 oz.; alcohol, 1 qt.; digest in a close vessel in a warm situation for three or four days, then decant and strain. Highly recommended.

2. Substitute lac bleached by chlorine for seed lac. Both are very tough, hard and durable, the last almost colorless. Used for pictures, metal, wood or leather.

Lac Water Varnish.—

Pale shellac	5 oz.
Borax	1 oz.
Water	1 pt.

Digest at nearly the boiling point till dissolved, then strain. An excellent vehicle for water colors, inks, etc., and a varnish for prints is made thus of bleached lac. When dry, it is transparent and waterproof.

Leather, Varnish for Fastening to Metal.—Dissolve 1 oz. gum arabic in water and an equal amount of isinglass in brandy.

Leather, Flexible Varnish for.—

1. Burnt umber	2 oz.
Asphaltum	1 oz.
Linseed oil	1 qt.

Dissolve the asphaltum with heat in a little of the oil, then add the umber ground in the oil; mix, add the rest of the oil; boil, and when cool, thin with turpentine.

2. Immerse a sheet of paper in a solution of gelatine, then dry and soak the paper in a solution of tannic acid. The gelatine will be converted into a kind of varnish.

Black Leather Varnish.—1. Durable leather varnish is composed of boiled linseed oil, in which a drier, such as litharge, has been boiled. It is colored with lampblack. This varnish is used for making enameled leather.

2. Shellac	12 parts.
White turpentine	5 parts.
Gum sandarac	2 parts.
Lampblack	1 part.
Spirits of turpentine	4 parts.
Alcohol	96 parts.

Patent Leather.—Patent leather cannot be prepared on a small scale and all attempts of the amateur will probably end in failure.

1. The first coat varnish is prepared as follows: Prussian blue (containing a trace of alumina), 5 oz; drying oil, 1 gal.; boil to the consistency of single size, and when cold, grind with a little vegetable black. The second coat is like the first, except that pure Prussian blue is used. The third coat has the oil boiled longer and more of the blue and lampblack is added.

2. The last coat is the same except that it must contain ⅛ lb. pure Prussian blue and ¼ lb. of pure vegetable black per gal.

Le Blond's Varnish.—Heat 1 lb. balsam of copaiba in a sand bath, then add 4 oz. copal, 1 oz. each day. The copal must have been previously fused and powdered.

Linseed Oil Varnish.—Boil linseed oil, 60 parts, with litharge, 2 parts; white vitriol, 1 part; each finely powdered, until all water is evaporated. Then set by. Or, rub up borate of manganese, 4 parts, with some of the oil, then add linseed oil, 3,000 parts, and heat to boiling.

Lithographs and Drawings.—Dextrine, 20 parts; alcohol, 5 parts; water, 20 parts. Give a couple of coats of starch paste, then varnish.

Lithographic Varnish.—Put 2 qt. of the best linseed oil into a saucepan large enough to hold 1 gal. The lid should have a long handle, so that it may be put on the vessel with safety while the contents are burning. Set it on a clear fire until white fumes arise. Apply a lighted paper occasionally until these fumes catch fire and burn. It must now be watched carefully, so that the flame shall not become unmanageable. If the flame goes down a little it may be increased by stirring with an iron rod. If it shows a tendency to rise too high, it may be removed from the fire, when it will still continue to burn. If it rises too high and threatens to become dangerous, the lid must be put on, when the flame, being deprived of the access of air, will be extinguished. If the flame has been very high, the lid should be kept

on long enough to allow the whole of the oil to cool down a little. The oil is burned until it becomes ⅛ less. A thick slice of bread is now put in and moved about with a fork until it is browned. It is then allowed to burn a little more, it being set on the fire again to revive the flame if the latter has become dull. A second slice is now put in and browned as before. This proceeding is said to free the oil from its more greasy particles. One-fourth of the oil may now be taken away. If, on becoming cold, it is of a syrupy nature, it may be set aside for thin varnish. The rest having been burned again for a short time, ⅛ part is taken away This is medium varnish. The remainder is again burned and ⅛ set aside for strong varnish. The fourth portion is again burned, and when cold should be thick and ropy. It is necessary to take every precaution to guard against accident.

Machinery, Asphaltum Varnish.—First paint the articles in a japan color such as the following:

Asphaltum	3	oz.
Boiled oil	4	qt.
Burnt umber	8	oz.

Mix by heat, and when cooling, thin with turpentine. Then coat them with a suitable transparent or light varnish.

Mahogany.—1. Sorted gum anime, 8 lb.; clarified oil, 3 gal.; litharge and powdered dried sugar of lead, of each ¼ lb.; boil till it strings well, then cool a little, thin with oil of turpentine, 5½ gal., and strain.

2. Put in a bottle 2 oz. gum sandarac, 1 oz. shellac, ½ oz. gum benjamin, 1 oz. Venice turpentine and ½ pt. of 90% alcohol. Color red with dragon's blood or yellow with saffron. Stand in a warm spot till gum dissolves, when strain for use.

Maps, Prints, etc., Varnish for.—1. Gum mastic, 5 oz.; gum sandarac, 2 oz.; gum camphor, 1 oz.; alcohol, 95°, 16 oz.

2. Balsam of Canada, 2 oz.; spirits of turpentine, 4 oz. The paper should first be sized with a solution of isinglass, and dried before applying the varnish.

3. Use Canada balsam or dammar varnish. The principal trouble will be in removing the old wax. The paper must be perfectly dry.

4. Mounted maps are sized with thin white glue and varnished with mastic.

5. A good varnish for paper and maps is made with gum mastic, 6 parts; sandarac, 3 parts; dissolved in a mixture of 3 parts turpentine and 32 parts of alcohol. These ingredients, with the exception of the turpentine, are placed in a copper vessel tinned inside, situated in a bath of hot water, and are stirred for several hours until the gums are dissolved; the turpentine is then added, and the stirring continued an hour longer, after which strain the varnish and set it aside for use.

Varnishing Paper Diagrams and Maps.—The first and most essential operation is the proper sizing of the paper, as, if this be imperfectly done, almost any kind of varnish will penetrate the paper so as to make oil spots. Glue water of the proper consistency is the best protective against the absorption of the varnish. It should be of the right strength, however. If, after being dried, it cracks in bending a corner of the paper, it was not diluted enough. When dry, the map is varnished with a solution of mastic, sandarac, or some other colorless resin in turpentine or alcohol, or a mixture of both; experience shows the best consistency in order to lay it on evenly with a brush. In cold weather it requires more of the solvent.

Mastic Varnish.—Picture Varnish, Turpentine Varnish.—1. Fine. Very pale and picked gum mastic, 5 lb.; glass pounded as small as barley, and well washed and dried, 2½ lb.; rectified turpentine, 2 gal.; put them into a clean 4 gal. stone or tin bottle, bung down securely, and keep rolling it backward and forward pretty smartly on a counter or any other solid place for at least 4 hours; when, if the gum is all dissolved, the varnish may be decanted, strained through muslin into another bottle, and allowed to settle. It should be kept for 6 or 9 months before use, as it thereby gets both tougher and clearer.

2. Second Quality.—Mastic, 8 lb.; turpentine, 4 gal.; dissolve by a gentle heat, and add pale turpentine varnish, ½ gal.

3. Gum mastic, 6 oz.; oil of turpentine, 1 qt.; dissolve.

Mastic varnish is used for pictures, etc.; when good, it is tough, hard, brilliant, and colorless.

4. One pt. spirits of turpentine and 10 oz. of the clearest gum mastic. Set it in a sand bath till it is all dissolved, then strain it through a fine sieve, and it is ready for use; if too thick, thin with spirit of turpentine.

Metals, Varnish for.—

1. Copal	1	part.
Alcohol	2	parts.
2. Copal	1	part.
Oil rosemary	2 or 3	parts.
Alcohol		

Apply hot.

Varnish for Iron and Steel.—3. Dissolve in alcohol—

Mastic	10	parts.
Camphor	5	parts.
Sandarac	15	parts.
Elemi	5	parts.

Apply cold.

Varnish for Polished Metal.—1. Take bleached shellac, pounded in a mortar; place the bruised fragments into a bottle of alcohol until some shellac remains undissolved; agitate the bottle and contents frequently and let the whole stand till clear; pour off the clear fluid. This forms the varnish. Warm the metal surface, and coat with a camel hair brush. If not perfectly transparent, warm the varnished surface before a fire or in an open oven until it becomes clear. Common orange shellac answers equally well, and for large surfaces even better, as it is more soluble than the bleached variety, and coats more perfectly, but care must be taken not to use the varnish insufficiently diluted. 2. Digest 1 part of bruised copal in 2 parts of absolute alcohol; but as this varnish dries too quickly, it is preferable to take—

Copal	1	part.
Oil of rosemary	1	part.
Absolute alcohol	2 or 3	parts.

This gives a clear varnish as limpid as water. It should be applied hot, and when dry it will be found hard and durable.

Mordant Varnish.—

1. Mastic	1½	oz.
Gum gamboge	¾	oz.
Sandarac	1½	oz.
Turpentine	⅝	oz.
Spirits of turpentine	9	oz.

in

A very simple mordant is made by dissolving a little honey in thick glue. It heightens the color of gold, and the leaf adheres well.

2. Spirits of turpentine	9	oz.
Sandarac	1½	oz.
Gum gamboge	¾	oz.
Mastic	1½	oz.

3. In 12 oz. spirits of turpentine dissolve 2 oz. each of mastic and sandarac, 1 oz. of gamboge, and ½ oz. of turpentine.

Negative Varnish.—

1. Sandarac	4	oz.
Alcohol	28	oz.
Oil of lavender	3	oz.
Chloroform	5	drm.
2. White hard varnish	15	oz.
Methylated alcohol	25	oz.

This will be found a good and cheap varnish

if durability is not required, as it is easily rubbed up for retouching upon, and easily cleaned off. Very suitaole for enlarged negatives that are not to be retained.

3. Sandarac	90	oz.
Turpentine	36	oz.
Oil of lavender	10	oz.
Alcohol	500	oz.

This may be rubbed down with powdered resin, and gives a splendid surface for retouching:

4. Sandarac	2	oz.
Seed lac	1 to 1½	oz.
Castor oil	3	drm.
Oil of lavender	1½	drm.
Alcohol	18	fl. oz.
5. Best orange shellac	1½	oz.
Methylated alcohol	1	pt.

Keep in a warm place until dissolved; then add a large teaspoonful of washing or prepared chalk; set aside to clear, and then decant. This is specially recommended for gelatine negatives.

6. Bleached lac	30	parts.
Mastic	10	parts.
Venetian turpentine	1	part.
Rectified alcohol	250	parts.

The negative must be warmed.

7. Bleached shellac, 3 oz., dissolved in 24 oz. alcohol; filter when dissolved, which takes one or two days, then add gum sandarac, 1 oz.; essential oil lavender, 1½ oz.; filter again and bottle for use. Formula of M. Carey Lea. said to be excellent.

Negative Retouching Varnish. See *Retouching Varnish* below.

Matt Varnish.—

1. Gum mastic	40	grn.
Gum sandarac	160	grn.
Methylated spirit	4	oz.
Benzol	1½	oz.

Black Matt Varnish.—

2. Gum mastic	50	grn.
Gum sandarac	200	grn.
Methylated ether	1½	oz.
Benzol	½	oz.

3. A very fine varnish is that recommended by M. Léon Vidal. It is composed of sandarac, 18 parts; mastic, 4 parts; ether, 200 parts; benzol, 80 to 100 parts. See that the glass is perfectly clean.

Mechanics, Varnish for.—Rosin, 5 parts; dragon's blood, 1 part; gamboge, 1 part; gutta percha, 2 parts, shellac, 1 part; volatile tar oil, 40 parts. This lacquer is very useful, and is largely used.

Metal Surfaces, Varnish for.—To make alcoholic lacquers or varnishes adhere more completely to polished metal surfaces, 1 part boracic acid should be added to 200 parts of varnish. This composition will adhere so firmly and become so completely glazed as to be removed only with difficulty. Be careful not to add too much of the boracic acid, as it injures the gloss in that case.—*The Metal Worker.*

Metallic.—One lb. of grain tin is melted with 4 oz. bismuth; add 4 oz. mercury, and stir till cold. Now grind it very fine with varnish or white of egg. This is sometimes called varnisher's amalgam.

Metals, Green Varnish for.—1. Dissolve sandarac in very strong potash lye until the lye will dissolve no more. Precipitate, after diluting with water, with copper acetate. The green precipitate which will now be formed is dissolved in oil of turpentine after having been washed and thoroughly dried.

2. To thin copal varnish add 5 parts Chinese blue and 10 parts potassium chromate.

Machinery, Varnish for Foundry Patterns and.—A varnish has been patented in Germany for the above purpose, which, it is claimed, dries as soon as put on, gives the patterns a smooth surface, thus insuring an easy slip out of the mould, and which prevents the pattern from warping, shrinking, or swelling, and is quite impervious to moisture.

1. This varnish is prepared in the following manner: 30 lb. shellac, 10 lb. Manila copal, and 10 lb. Zanzibar copal are placed in a vessel, which is heated externally by steam, and stirred during four to six hours, after which 150 parts of the finest potato spirit are added, and the whole heated during four hours to 87° C. This liquid is dyed by the addition of orange color, and can then be used for painting the patterns.

2 When used for painting and glazing machinery, it consists of 35 lb shellac, 5 lb. Manila copal, 10 lb. Zanzibar copal, and 150 lb. spirit.

Nets, Varnish for.—1. The following is a good waterproof composition, and is very pliable: Dissolve soft soap in hot water and add a solution of sulphate of iron. An insoluble iron soap is precipitated, which must be collected, washed, and dried. It must be then mixed to the right consistence with linseed oil and it is then ready to apply.

2. Fry paraffin wax, melted with a small portion of raw linseed oil, both for lines and nets; see that they are perfectly dry before putting them into the above hot, and you will say you have found nothing to equal it. When you take them out, wring them dry before the fire in an old duster or cloth.

Oak Varnish.—1. Clear pale resin, 3½ lb.; oil of turpentine, 1 gal.; dissolve. It may be colored darker by adding a little fine lampblack.

2. To the last add 20 oz. Canada balsam. Oak varnish is *syn.* with common turpentine varnish and wainscot varnish.

3 Clear Venice turpentine, 4 lb.; oil of turpentine 5 lb.; mix. Both are good common varnishes for wood or metal.

Oil Varnish.—

1. Rosin	3	lb.
Melt, add—		
Venice turpentine	2	lb.
Pale drying oil	1	gal.

Cool a little and thin with oil of turpentine, 1 qt.

2. Rosin, 3 lb.; drying oil, ½ gal.; melt and thin with oil of turpentine, 2 qt. Both the above are good varnishes for common work.

Paintings, Varnish for.—Take of mastic, 6 oz.; pure turpentine, ½ oz.; camphor, 2 drm.; spirits of turpentine, 1½ oz. Add first the camphor to the turpentine; the mixture is made in a water bath. When the solution is effected, add the mastic and the spirits of turpentine near the end of the operation; filter through a cotton cloth.

Paper Varnish.—The following formula affords very good varnishes for drawings that have been previously sized with gelatine: Canada balsam, 1 oz.; oil of turpentine, 2 oz.; or, Canada balsam, 4 oz.; camphine, 8 oz.

Patterns, Varnish for.—Alcohol, 1 gal.; shellac, 1 lb. Lamp or ivory black sufficient to color it. See also *Machinery Varnishes* above.

Picture Varnish.—Several varnishes are called by this name. Pale copal or mastic varnish is generally used for oil paintings, and crystal, white hard spirit, or mastic varnish, for water color drawings on paper.

Plaster of Paris Casts, to Varnish.—Of white soap and wax, take each ½ oz.: of water, 2 pt.; boil them together for a short time in a clean vessel. This varnish is to be applied, when cold, by means of a soft brush. It does not sink in, it readily dries; and its effect may be heightened by lightly using a silk handkerchief.

Pocket Books, etc., Varnish for.—Use 6 oz. mastic, in drops; 3 oz. coarsely powdered glass, separated from the dust by a sieve; 32 oz. spirits of wine of 40°. Place the ingredients in a sand

bath over a fire, and let them boil, stirring well. When thoroughly mixed, introduce 3 oz. spirits of turpentine, boil for half an hour, remove from the fire, cool, and strain through cotton cloth. Great care in manipulation is requisite to avoid a conflagration. Use a closed fire and watch incessantly.

Print Varnish.—A compound of benzole and almond oil. This print varnish does not give the slightest glaze to photographs on plain paper.

Printer's Varnish.—This varnish diluted with twice its volume of oil of turpentine forms an excellent common varnish.

Printer's Varnish for Ink.—To each cwt. linseed oil (clarified) add 50 lb. clear black resin and 5 lb. oil of turpentine. The varnish is now ready to be incorporated with the coloring matter.

Printer's Tar Oil Varnish.—Linseed oil, 50 parts; litharge, 3 parts; pine resin, 20 parts; tar varnish oil, 10 parts. The litharge is boiled with the linseed oil and pine resin until the mass commences to draw threads in cooling; the varnish oil is then added.—*Dingler's Poly. Journal.*

Prints, Varnish for.—1. A piece of plate glass is heated, and while yet warm, a little wax rubbed over it; water is then poured over the plate, and the moistened picture laid thereon and pressed closely down by means of a piece of filtering paper. When dry, the picture is removed, and will be found to possess a surface of great brilliancy, which is not injured by the process of mounting.

2. Boil Chio turpentine till brittle, powder, and dissolve in oil of turpentine.

3. Canada balsam and clear white resin, of each 6 oz.; oil of turpentine, 1 qt.; dissolve.

4. Digest gum sandarac, 20 parts; gum mastic, 8 parts; camphor, 1 part; with alcohol, 48 parts. The map or engraving must previously receive 1 or 2 coats of gelatine.

Retouching Varnish.—

1. Sandarac	1	oz.
Castor oil	80	grn.
Alcohol	6	oz.

First dissolve the sandarac in alcohol, and then add the oil.

2. Luckardt's.—

Alcohol	150	parts.
Sandarac	25	parts.
Camphor	2½	parts.
Castor oil	5	parts.
Venetian turpentine	2½	parts.

3. A good retouching varnish is a boon to all retouchers, and those who are unfortunate enough to be plagued by too thin films will gladly hail a formula which promises this desideratum. In his recent work on retouching, M. Janssen, the *Photo. Correspondenz* says, recommends the following varnish:

Alcohol (sp. gr. 0·830)	60	parts.
Sandarac	10	parts.
Camphor	2	parts.
Venetian turpentine	4	parts.
Oil of lavender	3	parts.

This varnish may also be used for paper pictures. The retoucher should not set to work as soon as the negative has been varnished, as the film will not then be hard enough to bear the touch of a lead pencil. The varnished film is in best condition for retouching when a day old.

Rubber, Shellac Varnish for.—Powder shellac and soak in well stoppered bottle with ten times its weight of strong ammonia. Allow it to stand for a number of days, when the shellac disappears. Sometimes several weeks are required to effect complete solution. If for use on overshoes, add a little lampblack.

Rubbers, Varnish for.—Dissolve 1 oz. finely powdered shellac in 10 oz. strong ammonia. This must be kept in a bottle with a ground glass stopper. After several days the shellac will become dissolved. Apply with a rag.

Sealing Wax Varnish.—Dissolve sealing wax of any color in strong alcohol. Apt to be rather brittle.

Shellac Varnish.—1. *a*, Shellac, 60 grm.; *b*, alcohol, 60 grm.; *c*, castor oil, 25 grm.; *d*, alcoholic solution of anilin dye, a few drops. *a* and *b* are dissolved and heated until quite thick, then a little of *d* is added, and for every 60 grm. of the mixture add 25 grm. of castor oil, and heat for a short time.

2. Harris'.—Put 1 oz. shellac into a wide mouthed 8 oz. phial, containing 5 oz. rectified naphtha or wood spirit. Cork and stand in a warm place until the gum is dissolved. Shake frequently and filter, adding more naphtha to assist the filtering, and changing the filter from time to time.

Imitation Shellac Varnish.—The following article under this name is used by furniture dealers:

Gum sandarac	1½ lb.
Pale rosin	1½ lb.
Benzine	2 gal.

Dissolve by gentle heat. The varnish is quick drying.

Varnish for Boots and Shoes.—1. Boil together 1 pt. linseed oil, ½ lb. of mutton suet, the same quantity of beeswax, and a small piece of resin, and when the mixture becomes milk warm apply it with a hair brush. After two applications the article will become waterproof. Great caution must be exercised in melting the above ingredients.

2. Common tar may be made warm, and brushed over the soles of boots and shoes. They are then placed near the fire, so that the tar may be absorbed. When the absorption has taken place, a second or third application may be given with advantage. This application is not suitable for the upper leathers.

3. India rubber varnish will be found very useful for anointing the upper leather of boots and shoes.

Shoes. See also **Blacking.**

Elastic and Clean Varnish for the Leather of Ladies' Shoes.—Three pounds of rain water are placed in a pot over fire, and when well boiling there are added 4 oz. white pulverized wax, 1 oz. clear, transparent glue, in small pieces, 2 oz. pulverized gum Senegal, 2 oz. white soap scraped fine, 2 oz. brown pulverized sugar; the ingredients are placed in one by one, and every time stirred up; it is well to take the pot from the fire every time a substance is added, to prevent boiling over; when all is added, the pot is removed from the fire; when sufficiently cooled, 3 oz. alcohol are added, and finally 3 oz. fine Frankfort black, well incorporated by continued stirring. This varnish is put on the leather with a brush, and very valuable for boots and shoes, as it can be afterward polished with a large brush, like ordinary shoeblacking; shows a high polish, and does not soil the clothing.

Shoes, Varnish for the Edges of.—

Alcohol	8	fl. oz.
Shellac	2	oz.
Resin	1	oz.
Turpentine	½	oz.
Lampblack	¼ or ⅛	oz.

Sign Painter's Varnish.—To 2 qt. drying linseed oil, add 2 lb. best copal, ⅛ lb. lead acetate, ⅛ gal. turpentine. Boil the copal for several hours until very thick, before adding the turpentine.

Silverware, Varnish for.—Gum elemi, 30 parts; white amber, 45 parts; charcoal, 30 parts; spirits of turpentine, 375 parts. It must be used in a heated state, the metal to which it is to be applied being also heated.

Spirit Varnish.—Brown Hard.—

1. Sandarac	4	oz.
Pale seed lac	2	oz.
Elemi (true)	1	oz.
Alcohol	1	qt.

Digest with agitation till dissolved, then add Venice turpentine, 2 oz.

2. Gum sandarac..... 3 lb.
Shellac..... 2 lb.
Alcohol, 65 over proof..... 2 gal.

Dissolve, add turpentine varnish, 1 qt.; agitate well and strain. Very fine.

3. Seed lac..... 1½ lb.
Yellow resin..... 1½ lb.
Rectified alcohol..... 2 gal.

4. White Hard.—

Gum sandarac..... 5 lb.
Camphor..... 1 oz.
Alcohol, 65 over proof..... 2 gal.
Washed and dried coarsely pounded glass..... 2 lb.

Proceed as in making mastic varnish. When strained add 1 qt. of very pale turpentine varnish.

5. Picked mastic..... 4 oz.
Coarsely ground glass..... 4 oz.
Sandarac..... 3 oz.
Pale clear Venice turpentine ... 3 oz.
Alcohol..... 2 lb.

As last.

6. Gum sandarac..... 1 lb.
Clear Strasburgh turpentine..... 6 oz.
Alcohol, 65 over proof..... 3 pt.

Dissolve.

7. Mastic, in tears..... 2 oz.
Sandarac..... 8 oz.
Gum elemi..... 1 oz.
Strasburgh or Scio turpentine (genuine)..... 4 oz.
Alcohol, 65 over proof..... 1 qt.

Used on metals, etc. Polishes well.

8. Soft Brilliant.—

Sandarac..... 6 oz.
Elemi (genuine)..... 4 oz.
Anime..... 1 oz.
Camphor..... ½ oz.
Alcohol..... 1 qt.

As before.

The above spirit varnishes are chiefly applied to objects of the toilet, as work boxes, card cases, etc., but are also suitable to other articles, whether of paper, wood, linen, or metal that require a brilliant and quick drying varnish. They mostly dry almost as soon as applied, and are usually hard enough to polish in twenty-four hours. Spirit varnishes are less durable and more liable to crack than oil varnishes.

Stopping Out Varnishes, Petit Vernis.—Lampblack made into a paste with turpentine. Used by engravers.

Stoves, Varnish for.—One pt. hot linseed oil is added to 2 lb. asphaltum; when thoroughly mixed, 2 qt. turpentine are added. Any asphaltum varnish can be used, but this is as cheap as any.

Stove Pipe, to Protect.—Varnish with—

Asphaltum..... 2 lb.
Boiled linseed oil..... 1 pt.
Oil of turpentine..... 2 qt.

Fuse the asphaltum in an iron pot, boil the linseed oil, and add while hot. Stir well and remove from the fire. When partially cooled add the oil of turpentine.

De Sylvestre's Dextrine.—Ten parts of dextrine are added to 30 parts of water, and 5 parts of alcohol are then added.

Table Varnish.—

1. Oil of turpentine..... 1 lb.
Beeswax..... 2 oz.
Colophony..... 1 drm.

2. Dammar resin..... 1 lb.
Spirits of turpentine..... 2 lb.
Camphor..... 200 grn.

Digest the mixture for twenty-four hours. The decanted portion is fit for immediate use.

Tar Varnish.—For wood or iron.

1. Coal tar..... 1½ gal.
Spirits of turpentine..... ¾ pt.
Oil of vitriol..... 3 oz.

Mix the tar and vitriol together with a stick, add the turpentine, and apply with a brush as it becomes thick.

2. Heat tar to 156° F. and mix with it equal parts of hydraulic lime, and Roman or Portland cement. The mixture is a *thin* fluid. When dry it is soft and flexible. This varnish prevents wood from rotting; especially good for wood under water and for shingles.

Theatrical Varnish.—For affixing mustaches.

Resin..... 4 parts.
Oil ricini..... 1 part.
Methylated spirit..... 16 fl. pts.

Dissolve, strain and perfume.

Tingry's Varnish. See *Mastic.*

Tinner's Varnish.—1. Mix lampblack with shellac.

2. Mix Frankfort black with shellac.

3. Mix Frankfort black with a mixture of asphaltum and oil of turpentine, then add a little linseed oil and minium. The exact proportions of tinner's varnishes are immaterial.

Tools, Varnish for.—Tallow, 4 oz.; resin, 2 oz.; melt, and strain while hot. With a brush apply a coat to the tools and it will prevent their rusting.

Toy Varnish.—This varnish is similar to common spirit varnish, but carefully rectified wood naphtha must be used as a solvent.

Transferring Varnish.—

Mastic in tears..... 6½ oz.
Resin..... 12½ oz.
Pale Venice turpentine..... 25 oz.
Sandarac..... 25 oz.
Alcohol..... 5 pt.

Dissolve in a clean bottle or can in a warm place, frequently shaking it. When the gum is dissolved strain it through a lawn sieve and it is fit for use.

Transfer Varnish for Diaphanie, Engravings, etc.—1. Pale Canada balsam and rectified oil of turpentine, equal parts.

2. Mastic in tears and sandarac, each 4 oz.; rectified spirit, 1½ pt.; dissolve, and add pale Canada balsam, ½ pt. Melt the balsam with a gentle heat, mix with the other ingredients and agitate violently. No. 1 is also termed crystal varnish.

Transparent Green, Varnish.—Grind a small quantity of Chinese blue and chromate of potash together, and mix them thoroughly in common copal varnish thinned with turpentine. The blue and the chromate must be ground to an impalpable powder, and the tone of color varied with the amount of each ingredient used. A yellow green requires about twice the quantity of the chromate of potash to that of the Chinese blue.

Trays (Photographic), Varnish for.—Use asphaltum varnish, or coat the bottom or sides of the wooden tray with—

	By weight.
Resin	1 part.
Beeswax	2 parts.
Paraffine	3 parts.

Melt the above first, warm the tray, and while hot apply composition with a brush.

Turpentine Varnish.—To 1 pt. spirits of turpentine add 10 oz. clear resin, pounded; put it in a tin can on a stove and let it boil for half an hour. When the resin is all dissolved, let it cool and it is ready for use.

See also *Oak* and *Wainscot* varnishes.

Umbrella Varnish. — Ten parts pulverized litharge and 20 parts turpentine are boiled in 20 parts linseed oil. Dry in the sun.

Violin Varnish.—1. The famous Italian violin

makers used, it is said, the following sort of varnish on their instruments: Rectified alcohol, ½ gal.; 6 oz. gum sandarac, 3 oz. gum mastic and ½ pt. turpentine varnish. The above ingredients are put into a tin can by the stove and frequently shaken until the whole is well dissolved. It is finally strained and kept for use. If upon application it is seen to be too thick, thin with an addition of more turpentine varnish. The wood should be stained before applying the varnish. For a red stain use camwood, logwood, or aniline.

2. Red Varnish for Violins.—Dissolve over a moderate fire—

Sandarac	12	parts.
Shellac	6	parts.
Mastic	6	parts.
Elemi	3	parts.

In 150 parts 95% alcohol which has been colored red with cochineal, or if a darker red is required, add dragon's blood gum. When the above is dissolved add 6 parts Venice turpentine. As this varnish is highly inflammable, use caution as to fire. Find the tone of a piece of wood by direct comparison with similar notes on the piano or any standard instrument. A violin in tone at the proper pitch by a tuning fork is very convenient.

3. Tone of Wood for Same.—Dissolve by heat 2 oz. amber in oil of turpentine, 5 oz., and drying linseed oil, 5 oz. Color with dragon's blood or extract alkanet root. The tone given by a piece of wood depends upon its size, thickness, etc. Therefore, a test must be comparative. Cut square plates of equal size and thickness of a known wood and of the wood to be tried. Place the center of the plate upon end of a cork or spool placed upon a table near the edge. Press the center of the plate of wood with the thumb and bow it near one of the corners. This will give the lowest note such a plate can produce, or the normal tone. The higher the tone, the better the wood.

4. Coarsely powdered gum copal and glass, each 4 oz.; alcohol, 64 o. p., 1 pt.; camphor, ½ oz.; heat in a water bath with frequent stirring, so that the bubbles may be counted as they rise until solution is complete, and when cold decant the clear portion. When oil varnish is used it is made from artists' vinegar copal.

5. The true Cremona varnish is of unknown formula; its preparation is a lost art.

Amber, fused	2	oz.
Oil of turpentine	5	oz.
Drying linseed oil	5	oz.

The following is for a spirit varnish:

Mastic	1	dr.
Sandarac	1	dr.
Lac	6½	dr.
Alcohol	5	fl. oz.

To tinge with yellow, annatto, aloes, gamboge, or turmeric may be used; for red, dragon's blood or red sanders wood. By mixing the above, intermediate shades may be obtained. The formula is only half the art; much depends on the application, treatment between coats, etc. It should be done by an expert.

6. The receipt for violin varnish as used by German violin makers is four parts sandarac resin, 2 parts shellac, 1 part mastic, 2 parts benzoes resin, 2 parts Venetian turpentine, and 32 parts of alcohol. The solid ingredients are first dissolved in the alcohol and the Venetian turpentine added afterward, and finally the whole carefully filtered to get rid of all dust. Brushes to be kept scrupulously clean. For staining, Campeachy wood is used, mixed with about ¼ yellow dyewood, and boiled for two hours in 5 times its weight of water in a copper or earthenware vessel; no iron should come in contact with it, as this makes the solution black. The violins are colored with this solution when well cleaned, and afterward varnished.

7. Coarsely powdered copal and glass, each 4 oz.; alcohol, 64 o. p., 1 pint; camphor, ½ oz.; heat the mixture with frequent stirring in a water bath, so that the bubbles may be counted as they rise, until solution is complete, and when cold, decant the clear portion. When oil varnish is used it is made as for artists' virgin copal.

Wainscot Varnish.—Eight lb. of second sorted gum anime, 3 gals. of clarified oil, ¼ lb. of litharge, ¼ lb. of dried copperas, ¼ lb. of dried sugar of lead, 5½ gal. of turpentine; to be all well boiled until it strings very strong, and then mixed and strained. Where large quantities are required, it will always be found best to boil off the three runs in the boiling pot. This varnish is principally intended for house painters, grainers, builders, and japanners; it will dry in two hours in summer and in four in winter.

Waterproof Varnish.—1. Boil together until thoroughly incorporated, 2 qts. linseed oil and ½ lb. flour of sulphur. Used for waterproof textile fabrics.

2. Oxide of lead 5 lb.; lampblack 2½ lb.; sulphur 6¼ oz., India rubber dissolved in turpentine, 12½ lb. Boil until thoroughly mixed.

3. Let a ¼ lb. of India rubber, in small pieces, soften in ½ lb. of oil of turpentine; then add 2 lb. of boiled oil, and boil for 2 hours over a slow fire. When dissolved, add 6 lb. of boiled linseed oil and 1 lb. of litharge, and boil until an even liquid is obtained. Applied warm.

Wax Varnish.—Wax (pure), 5 oz.; oil of turpentine, 1 qt.; dissolve. Used for furniture.

Wax Varnish to Preserve Statues and Marble Exposed to the Air.—Melt 2 parts of wax in 8 parts of pure essence of turpentine. Apply hot, and spread thinly, so as not to destroy the lines of the figures. This varnish may be used upon statues which have been cleansed with water dashed with hydrochloric acid, but they must be perfectly dry when the application is made.

Varnish Finish.—For Cheap Work.—One coat of filler or stain, followed by one coat of cheap turpentine varnish, without rubbing. In this class of work the brilliancy of the gloss and covering qualities of the varnish are principally considered. The cheaper turpentine varnishes have a brilliant gloss, and dry very hard, but the gloss is not permanent, and after drying, the gum is very brittle, and easily cracked and broken. The gum used is principally common resin.

Water Color Drawings, to Varnish.—1. Boil some parchment in clear water until it becomes a clear size, strain, and keep for use; give your work two coats, not applying the second before the first has dried, and observing to do it quickly and lightly. When dry apply the following varnish: 1 oz. Canada balsam, 2 oz. oil turpentine, well dissolved.

2. Size the drawing thoroughly and carefully with a solution of isinglass. When perfectly dry, brush the following varnish over it: 4 oz. clear balsam of Canada and 8 oz. camphine, warmed gradually, and shaken together till dissolved. This mixture is generally called Canada varnish, and is used for varnishing drawings, maps, prints, etc.

3. The best way to effect this, without disturbing the colors, is to float over the surface of the drawing a sufficient quantity of colorless, fluid oxgall, and when thoroughly dry, with a coat of clear copal varnish thinned with the gall. This preparation of ox gall is invaluable to all water color artists, as it sets the colors beautifully.

White Varnish.—1. Tender copal, 7½ oz.; camphor, 1 oz.; alcohol of 95%, 1 qt. Dissolve, then add mastic, 2 oz., Venice turpentine, 1 oz. Dissolve and strain. Very white, drying, and capable of being polished when hard. Used for toys.

2. Sandarac, 8 oz.; mastic, 2 oz.; Canada balsam, 4 oz.; alcohol, 1 qt. 1. Ninety per cent. alco-

hol, 1 qt.; gum sandarac, 10 oz.; gum mastic, 2 oz.; gum anime, ½ oz. Dissolve in a clean can, with gentle heat. Agitate well when the gums are dissolved; strain through a lawn sieve.

White Hard Spirit Varnish.—1. Gum sandarac, 1 lb.; clear turpentine, 6 oz.; alcohol (65 over proof), 3 pt.; dissolve.

2. Mastic, in tears, 2 oz.; sandarac, 8 oz.; gum elemi, 1 oz.; Chio turpentine, 4 oz.; alcohol (65 over proof), 1 qt. Used on metals; polishes well.

3. Gum mastic, 4 oz.; gum juniper, ½ lb.; turpentine, 1 oz.; 90% alcohol, 4 pt.; mix together.

White Toy Varnish.—Tender copal, 15 oz.; camphor, 2 oz.; alcohol, 95%, 2 qt.; dissolve, add mastic, 4 oz.; Venice turpentine, 2 oz.; dissolve and strain. White, dries easily, may be polished when hard. Used for toys.

Wood, Varnish for.—White Woods.—Dissolve 3 lb. of bleached shellac in 1 gal. 90% alcohol; strain, and add 1½ more gal. of 90% alcohol. If the shellac is pure and white, this will make a beautifully clear covering for white wooden articles.

Black Varnish for Wood.—1. A German trade circular describes two kinds of black varnish:

a. The ordinary black varnish for different kinds of wood. *b.* The black ebony varnish for certain woods which approach nearest to ebony in hardness and weight. The ordinary black wood varnish is obtained by boiling together blue Brazil wood, powdered gall apples, and alum, in rain or river water, until it becomes black. This liquid is then filtered through a fine organzine, and the objects painted with a new brush before the decoction has cooled, and this repeated until the wood appears of a fine black color. It is then coated with the following varnish: a mixture of iron filings, vitriol, and vinegar is heated (without boiling), and left a few days to settle. If the wood is black enough, yet for the sake of durability, it must be coated with a solution of alum and nitric acid, mixed with a little verdigris, then a decoction of gall apples and logwood dyes are used to give it a deep black. A decoction may be made of brown Brazil wood with alum in rain water, without gall apples; the wood is left standing in it for some days in a moderately warm place, and to it iron filings in strong vinegar are merely added, and both are boiled with the wood over a gentle fire. For this purpose soft pearwood is chosen, which is preferable to all others for black varnishing.

2. For the fine black ebony varnish, apple, pear, and hazel wood are recommended in preference for this; especially when these kinds of wood have no projecting veins, they may be successfully coated with black varnish, and are then most complete imitations of the natural ebony. For this varnish 14 oz. of gall apples, 3½ oz. of rasped logwood, 1¾ oz. of vitriol, and 1¾ oz. of distilled verdigris are boiled together with water in a well glazed pot, the decoction filtered while it is warm, and the wood coated with repeated hot layers of it.

For a second coating a mixture of 3 oz. of pure iron filings, dissolved in ¾ of a liter of strong wine vinegar, is warmed, and when cool the wood already blackened is coated two or three times with it, allowing each coat to dry between.

For articles which are to be thoroughly saturated a mixture of 1¾ oz. of sal ammoniac, with a sufficient quantity of steel filings, is to be placed in a suitable vessel, strong vinegar poured upon it, and left for fourteen days in a gently heated oven. A strong lye is now put into a good pot, to which is added coarsely bruised gall apples and blue Brazil shavings, and exposed for the same time as the former to the gentle heat of an oven, which will then yield a good varnish. The pear wood articles are now laid in the first named varnish, boiled for a few hours, and left in for three days longer; they are then placed in the second varnish, and treated as in the first. If the articles are not then thoroughly saturated, they may be once more placed in the first bath, and then in the second. More properly a stain.

Patent Varnish for Wood or Canvas.—Dissolve by heat, 4½ lb. asphaltum; 2 gal. of spirits of turpentine. When this mixture has cooled a little add 1 qt. copal varnish and 1 qt. of boiled linseed oil. If a deeper black is desired, a little lampblack may be added.

Parisian Wood Varnish.—R. Grager.—Dissolve 1 part of good shellac in 3 or 4 parts of 92% alcohol on the water bath, and cautiously add distilled water, until a curdy mass separates out, which is collected and placed between linen. The liquor is filtered through paper, all the alcohol removed by distillation from the water bath, and the resin removed and dried at 100 until it ceases to lose weight; it is then dissolved in twice its weight of alcohol, of at least 98%, and the solution perfumed with lavender oil.

Varnish for Wood Furniture.—Niedlig.—White wax, 8 parts; colophony, 2 parts; Venetian turpentine, ½ part. Heat gently with constant stirring, pour the mixture into a glazed stone pot, and add while still warm 6 parts of rectified oil of turpentine. After standing for 24 hours, the mass is a soft buttery substance, and is ready for use. The articles to be varnished must be carefully cleansed with soap and water, and dried before applying the varnish. The polish obtained is less brilliant than that obtained by shellac varnish; but it has a peculiar chaste appearance.

Varnish, to Clean. See **Cleansing.**

Vaseline Soap. See **Soaps.**

Vases, Iron, to Protect from the Weather.—White japan varnish baked on the vase in an oven or drying room at a temperature of 225° is the only white that will stand the weather. All air-drying paints weather.

Vaucher's Alloy. See **Alloys,** *White Metal.*

Veins, Blue for the. See **Rouges and Face Paints.**

Vehicle. See **Medium.**

Vellum.—A fine kind of parchment prepared from the skins of calves, kids and lambs. The skins are limed, shaved, washed and stretched in hoops or other frames, where they are scraped and trimmed with the currier's fleshing knife, and next carefully rubbed down with pumice stone; they are lastly polished with finely powdered chalk or fresh slaked lime, and then dried. A green color is given with a solution of crystallized verdigris to which a little cream of tartar and nitric acid have been added, and a blue color with a solution of indigo. The surface is often finished with white of egg, and subsequent friction. The skins of sheep are commonly used for parchment, those of goats and wolves for drum heads.

Vellum, to Clean. See **Cleansing.**

Velvets, to Clean. See **Cleansing.**

Veneering.—The veneer should be damped with a cloth dipped in hot water, then glued the reverse side; lay quickly on the board, and press out surplus glue with the pane of the hammer. The wood should be properly planed and finished off with a toothing plane, but for commoner work a brush of glue over the wood to be veneered, then dried, and veneer laid on as before. If properly laid, no weight or pressure is required for flat surfaces; but if circular or partly so, it should be bound round with string until the glue sets. Use good glue.

Veneers.—The veneer having been cut to the proper shape, the surface to which it is to be applied is coated uniformly with glue and the veneer is directly placed in position. The exterior surface of the veneer is then sponged over with warm water to prevent its curling.

Ventilation of Schoolhouses.—The plan of the U. S. army hospitals is perhaps the best. Have an air shaft from outdoors opening directly under the stove. Have openings for foul air in the top of the room and in baseboards, which may be closed, according to the weather.

Verdigris, *English.*—Blue vitriol, 24 lb.; white vitriol, 16 lb.; sugar of lead, 12 lb.; alum, 2 lb. (all coarsely powdered); mix and heat them in a pot over the fire until they unite into a mass. Sometimes sold for foreign verdigris.

Verdigris.—Ærugo, Vert-de-Gris.—This is a mixture of several basic acetates of copper, which have a green or blue color. It is obtained in the wine districts of the south of Europe by the action of refuse grapes from which the juice has been expressed, on thin sheets of copper. When pure it should dissolve almost entirely, and without effervescence, in dilute sulphuric acid. It is very poisonous.

Verditer.—Blue Verditer, Refiners' Verditer, *Cendres Bleues* (Fr.).—A blue pigment obtained by adding chalk, whiting, or milk of lime to a solution of copper in nitric acid, or by triturating recently precipitated and still moist carbonate of oxide of copper with hydrate of lime. Verditer is made into crayons while moist, or dried into a powder; or it is used as a water color in the moist state.

Vermin, to Exterminate. See Name of Insect, **Bugs,** etc.

Vermin in Water.—Go to the nearest river or pond, and with a small net (a piece of old mosquito bar will do), collect a dozen or more of the small fishes known as minnows, and put them in your cistern, and in a short time you will have clear water, the wiggletails and reddish-colored bugs or lice being gobbled up by the fishes.

Vermin on Trees and Plants, to Destroy.—The solution obtained by agitating together a quantity of water and recently slaked lime, and permitting the mixture to stand for a few hours in a covered vessel, is said to be excellent for this purpose, and very cheap. It may be sprayed on and around the twigs, using a small syringe with a finely perforated rose nozzle. A decoction of the dried leaves of the sumac tree is also said to preserve vines and plants from the attacks of insects. The application must be repeated occasionally. Besides these, sulphur, alkaline sulphides, calcium sulpho-carbonate, etc., are used with satisfactory results.

Vermouth. See **Liquors.**

Vert d'Eau. See **Alloys.**

Vespétro. See **Liquors.**

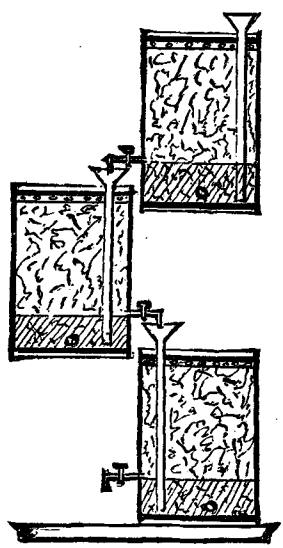
Vessels, Paint for. See **Paints.**

Vesuvium.—Seven lb. best glue are boiled in 3½ pt. of water; 3 lb. white resin are dissolved by heat in 3 pt. raw linseed oil; the two are mixed and simmered for ½ hour; and are then poured out on a quantity of whiting and mixed to the consistency of dough.

Or, boil 1¼ lb. best glue into thick solution, stir it into 10 oz. of resin, or, still better, Venetian turpentine. Add enough whiting or mineral color to bring it to a stiff paste and add a few drops of olive oil. These are the best formulas for making this substance.

Vinegar and Vinegars.—Including ordinary vinegar, aromatic, toilet vinegars, etc.

Vinegar Making.—The following description is for those who wish to make vinegar on a moderately large scale. For small quantities the receipts which follow are better adapted: The accompanying illustration shows the arrangements of the Hengstenberg generators. The stock mixture is contained in a reservoir situated above the generators. The generators, of which there may be from three to seven, stand vertically one above the other as stated. In the morning the upper generator cask is filled with the stock mixture from the reservoir, and as soon as it is filled, the faucet near the bottom of the upper cask is opened and the stock mixture allowed to fill the next lower generator cask. From this the stock mixture is drawn over the next lower cask and so on to the lowest one, so that every generator cask has been completely filled with the stock mixture for a short time. The faucets have an extra wide bore, so that the flow from one cask into the other takes the least possible time; they remain open after the liquid has flowed off, and thus are the means for the admission of air into the casks. The shavings with which the casks are filled are completely and uniformly soaked with the stock mixture, and dry places or nests, which often cause great troubles and irregularities in other systems, are an absolute impossibility with this system. The formation and spreading of disease, and more especially the propagation of the so-called vinegar flies, is prevented in this system. After the mixture has arrived in the lowest cask, about one fifth to one fourth is racked off as ready vinegar, so that if six generators of



150 gal. capacity are worked together daily, from 25 to 30 gal. of ready vinegar are drawn off. The balance of the stock mixture is now brought back to the reservoir, and enough fresh stock mixture is added to fill the same up. It remains there till the next morning, when it is carried through the same circuit in the same manner as above described. It is evident that the labor is very simple; the opening and closing of the faucets may be attended to by an apprentice, and the lifting of the stock mixture to the reservoir may be done by any common and untrained laborer, if, as it naturally would be in larger establishments, a pump is not preferred for this purpose. The building for a vinegar factory worked on this plan does not require any special appointments, and therefore any locality may be utilized, and such buildings having rooms from eight to ten feet high, one above the other, are very well adapted for arrangements on a larger scale. In every story two or three casks can be placed in such a manner that the lower cask in the upper story connects with upper casks of the next lower story by means of a piece of rubber hose, which is drawn over the faucet

key, and passes through a two-inch hole in the floor. The reservoir should be in the form of flat tubs (storage casks sawed in two will serve very well), and are placed in the top story, where it is warmest, and where the acidification of the stock mixture remains in constant activity.

The Hengstenberg system of generating vinegar, on the whole, offers some advantages, but it would appear to us that these advantages can be fully utilized only by works of comparatively small capacity, and that for yield in quantity and strength it cannot compete with the Schuetzenbach generators, if the same are worked by expert hands and under proper conditions. Nevertheless the progressive manufacturer will not lose anything by trying a set of small generators of this kind; it may be got up with almost no expense at all from a few odd barrels and faucets, and as it can be run regardless of interruptions, it may do good service in the production of one or the other fancy brands of vinegar, which to produce it is sometimes very desirable, although it would not be advisable to attempt the same by interrupting the working of a large generator.—*Chem. Review.*

1. Quick Process for Making Vinegar.—What is known as the German process is the most rapid method of making a good vinegar. In this, dilute alcoholic liquor to which one thousandth part of honey or extract of malt has been added is caused to trickle down through a mass of beechwood shavings previously steeped in vinegar and contained in a vessel called a vinegar generator (*essigbilder*). It may consist of a large oak hogshead or barrel furnished with a loose lid or cover, a few inches below which is fitted a perforated shelf, having a number of small holes loosely filled with packthread about six inches long, knotted at the upper end to prevent their falling through. Several small glass tubes, long enough to project slightly above and below the shelf, are also fitted in perforations in the shelf to serve as air vents. The vessel at the lower part is pierced with 8 or 10 holes equally distributed around the sides at about 6 inches above the bottom, to admit of the entrance of air. A small siphon tube, the upper curve of which is an inch below the air holes, serves to carry off the liquid as fast as it accumulates at the bottom. The alcoholic liquid, at a temperature of 75°-83° Fah., is run in on the shelf, and slowly trickles down through the holes by means of the packthread, diffuses itself over the shavings, slowly collects at the bottom, and runs off by the siphon exit. The air enters by the lower holes, passes freely through the shavings, and escapes by the glass tubes. The temperature within the apparatus soon rises to about 100° Fah., and remains stationary at this point, while the action goes on favorably. The liquid generally requires to be passed three or four times through the cask before its acetification is complete.

2. Put in 20 gal. rain water, 2½ lb. acetic acid, 1 gal. molasses, 1 qt. yeast. Stir well, and allow to stand from one to three weeks. If stronger vinegar is desired, add more molasses.

3. Molasses	2	qt.
Yeast	1	qt.
Soft water	6	gal.

Put in keg, and put wire gauze over bung and stand in warm place for three weeks.

4. Acetic acid	2	lb.
Molasses	2	qt.
Water	20	gal.

Shake and allow to stand two or three weeks.

5. Cider	20	gal.
Water	10	gal.
Yeast	2	gal.

6. Cheap Vinegar.—Put 2 gal. molasses and 2 qt. yeast in 12½ gal. of warm rain water. Let it ferment. As the vinegar is used, add the above ingredients in the same proportions.

7. A cheap vinegar consists of 25 gal. of warm rain water with 4 gal. of molasses and 1 gal. of yeast. The mixture can be used after it has been allowed to ferment.

Vinegars.—These are solutions of aromatics in acetic acid, and are highly esteemed as reviving perfumes, both for the toilet and sick room. They are corrosive, and should therefore be kept from contact with the skin and clothes. For use they should be dropped on a piece of sponge and placed in a stoppered bottle or vinaigrette. This refers to toilet vinegars.

Argol Vinegar.—White argol or cream of tartar, 1 lb.; boiling water, 8 gal. Disolve, and let it cool; add 1½ gal. proof spirit. Keep lightly cover in a warm place.

Aromatic Vinegar.—1. Henry's.—Dried leaves of rosemary; rue, wormwood, sage, mint and lavender flowers, each ½ oz.; bruised nutmeg, cloves, angelica root and camphor, each ¼ oz.; alcohol, rectified, 4 oz.; concentrated acetic acid, 16 oz.; macerate the materials for a day in the spirit; then add the acid and digest for a week longer at a temperature of 14° or 15° C. Finally press out the now aromatized acid and filter it.

2. Concentrated acetic acid, 8 oz.; otto of English lavender, 2 drm.; otto of English rosemary, 1 drm.; otto of cloves, 1 drm.; otto camphor, 1 oz. First disolve the bruised camphor in the acetic acid, then add the perfumery; after remaining together for a few days, with occasional agitation, filter. All vinegars are used by pouring 3 or 4 drm. into an ornamental smelling bottle, previously filled with crystals of sulphate of potash.

3. Aromatic Vinegar, Aromatic Acetic Acid, *Vinaigre Aromatique, Acide Acetique Aromatique*, Acetum Aromaticum, Acidum A. A.—The following are approved formulæ for this article:

Glacial acetic acid	1	lb.
Ninety per cent alcohol	2	fl. oz.
Camphor, pure, crushed small	2½	oz.
Oil of cloves, finest	1½	drm.
Oil of rosemary	1	drm.
Oil of bergamot	½	drm.
Oil of cinnamon	½	drm.
Oil of lavender	½	drm.
Oil of pimento	½	drm.
Neroli, or ess. de petit grain	½	drm.

Mix in a stoppered bottle and agitate until the whole of the camphor is dissolved. Very fine and highly esteemed.

4. Camphor	1	oz.
Oil of cloves	1	drm.
Oil of cedrat	40	grn.
Oil of lavender, Mitcham	40	grn.
Oil of bergamot	20	grn.
Oil of thyme	20	grn.
Oil of cinnamon	10	grn.
Glacial acetic acid	½	lb.

Mix as before. Very fine.

5. Aromatic Rose Vinegar.—Macerate ½ lb. dried red roses in 1 qt. vinegar for two weeks. Stir daily, filter, and bottle.

6. Cologne extract	2	oz.
Alcohol	3	pt.
Acetic acid	½	pt.
Orange flower water	½	pt.
7. Extract of cassia	½	pt.
Extract of violet	½	pt.
Extract of rose	½	pt.
Tincture of orris	½	pt.
White wine vinegar	2	pt.

Digest for ten days and filter.

8. Camphor, 1 oz.; oil of cloves, 1 drm.; oil of lavender, 40 drops; oil of rosemary, 40 drops; glacial acetic acid, 10 oz

9. Rosemary and thyme (origanum), of each dried, 1 oz.; lavender flowers, dried, ½ oz.; bruised cloves, ½ drm., acetic acid, 1½ pt.; digest for a week, filter and add camphor, 1½ oz.

Basil Vinegar, Burnt Vinegar, Celery Vinegar, Cherville Vinegar, Elder Flower Vinegar,

Green Mint Vinegar, Tarragon Vinegar are prepared by adding to each pt. of vinegar 2 to 3 oz. of the leaves, the whole being frequently shaken for fourteen days, then strained or filtered, and bottled.

Camp Vinegar.—1. Vinegar, 1½ qt.; walnut catsup, 1½ pt.; mushroom catsup, 4½ tablespoonfuls; garlic, 6 heads; cayenne, ¾ oz.; soy, 3 tablespoonfuls; port wine, 3 glasses; anchovies, 4 glasses; salt, 1½ tablespoonful. Put in a bottle, shake daily for a month, decant.

2. Sliced garlic, 8 oz.; Cayenne pepper, 4 oz.; soy, 4 oz.; walnut catsup, 4 oz.; 36 chopped anchovies; vinegar, 1 gal.; powdered cochineal, ½ oz. Macerate for a month, strain and bottle.

Camphorated Vinegar, Camphorated Acetic Acid, *Acidum, Aceticum Camphoratum.*—This is simply a solution of about 2 oz. of camphor in each lb. glacial (or nearly glacial) acetic acid. The following are pharmacopœial formulæ.—

	troy.
1. Camphor	½ oz.
	avoir.
Rectified alcohol (to powder)	a few drops.
Acetic acid (E. Ph.)	6½ fl. oz.

Dissolve.

	avoir.	
2. Camphor	1	oz.
	troy.	
Rectified alcohol	1	fl. drm.

Pulverize, and dissolve the powder in—

Strong acetic acid ..... 10 fl. oz.

These preparations were intended to supersede the aromatic vinegar of the shops, and the aromatic acetic acid of the former pharmacopœias. Though highly pungent and refreshing, they are less agreeable than true aromatic vinegar, and lack its delightful fragrance. They are often used as fumigations, in fevers, etc., and as an extemporaneous vesicant.

Chilli Vinegar.—Best vinegar, 1¼ qt.; English chillies, 125, cut or bruised (or ⅝ lb. Cayenne pepper). Digest two weeks.

Chilli Vinegar.—Twenty-five chillies (peppers) cut and bruised (or ⅛ oz. Cayenne pepper), to ½ pt. of the best vinegar. Digest for two weeks, strain and bottle.

Cider Vinegar.—1. Take, say 10 gallons new cider, and suffer it to ferment fully, which will probably be in about two weeks, if the weather be warm; then add about 8 gals. of new cider for producing a second fermentation, and in about 2 weeks add a like quantity to produce a third fermentation. Stop the bunghole of the barrel with an empty bottle with the neck downward, and expose to the sun. When the vinegar is come, set in a cool place. When making, let there be a moderate degree of heat and free access of external air. The process is hastened by adding to the cider a quantity of mother of vinegar, as it is called, a whitish ropy coagulum, of a mucilaginous appearance, which is formed in vinegar and acts as a ferment. The strength of vinegar depends on the amount of sugar or starchy matter to be ultimately converted into acetic acid. Cider made from late apples is esteemed the best for vinegar.

2. Put some of the cider in a clean cask and add to it some vinegar containing abundance of mother of vinegar; after some days, if the acetic fermentation has taken place and the souring is going on, add another portion of the cider, and at similar intervals a third and a fourth. When the whole has become vinegar, take out as much as is equal to the vinegar first put in, and replace by fresh cider, and so proceed. The casks should never be but partly full; good exposure to air is necessary, and the temperature should be kept up to 86° Fah.

3. Cider worked as malt vinegar.

Vinegar (Cider), to Test the Purity of.—Place some white sugar in a saucer, half fill with vinegar, and evaporate to dryness by placing on top of a boiling water kettle. If the sugar turns black, the vinegar contains an adulterating acid. This test is of course not universal, but is very simple and useful.

Vinaigre de Cologne.—To eau de Cologne, 1 pt., add strong acetic acid, ½ oz.

Cosmetic Vinegar, Piesse & Lubin's.—

Spirit	1	qt.
Gum benzoin	3	oz.
Concentrated aromatic vinegar	1	oz.
Balsam Peru	1	oz.
Otto neroli	1	dr.
Otto nutmeg	½	dr.

This is one of the best made.

Crystal Vinegar.—Pickling vinegar decolorized with freshly burned animal charcoal.

Culinary Vinegars.—Black Pepper Vinegar, Caper Vinegar, Celery Seed Vinegar, Chilli Vinegar, Cress Seed Vinegar, Garlic Vinegar, Ginger Vinegar, Horseradish Vinegar, Onion Vinegar, Red Rose Vinegar, Seville Orange Peel Vinegar, Shallot Vinegar, Truffle Vinegar, White Pepper Vinegar, with several others of a similar kind, are made by steeping about an ounce of the respective articles in a pint of good vinegar for fourteen days, and straining.

Currie Vinegar.—Good curric powder, ½ lb.; vinegar, 1 gal.; infuse for a week. Used as flavoring.

Curry Vinegar.—Curry powder, 18 oz.; vinegar, 1½ gal. Infuse in a warm place 5 days. Used as a flavoring.

Distilled Vinegar.—Vinegar (preferably French) 8 parts; distill over with a gentle heat 7 parts, and dilute the product, if necessary, with distilled water, until the sp. gr is 1·005.

Elder Flower Vinegar.—To every ½ peck of the flowers, free from stalks, put 1 gal. of strong ale vinegar; set in the sun in a stone jar for a fortnight, then filter through a flannel bag; bottle off into quite small bottles.

German Household Vinegar.—Soft water, 7½ gal.; honey or brown sugar, 2 lb.; cream of tartar, 2 oz.; corn spirit or whisky, 1 gal.

Ginger Vinegar.—Bruised ginger root, ½ lb.; vinegar, 6 qt; macerate two weeks, strain.

Gooseberry Vinegar.—1. Bruised gooseberries, 1¼ lb.; brown sugar, 1¼ lb.; water, 1 gal. Other fruits may be substituted for gooseberries.

2 To every gal. of water put 1 qt. of full ripe gooseberries. Boil the water first, and let it stand till quite cold; then crush the fruit with a wooden spoon, and add it to the water. Let it stand covered over for five days in a cool place, stirring it twice every day; strain it at the expiration of the five days through a hair sieve into a cask, and to every gallon of the liquor add 1¼ lb. of moist sugar. When it has stood for six months, bottle it.

Health Vinegar. (Vinaigre anti-Méphitique), Bully.—To 7 qt. of water, take—

Alcohol	4½	qt.
Essence of bergamot	1	oz.
Essence of lemon	1	oz.
Essence of Portugal	3	drm.
Essence of rosemary	6	drm.
Essence of lavender	2	drm.
Essence of neroli	1	drm.
Tincture of mélisse	1	pt.

Mix the whole together, and, after twenty-four hours' repose, add—

Infusion of storax	2	oz.
Infusion of benzoin	2	oz.
Infusion of cloves	2	oz.

Shake well again, then pour in 2 qt. of good vinegar, and after some hours filter, and mix 3 oz. of strong acetic acid.

Horseradish Vinegar.—Vinegar, 2 qt.; horseradish root, scraped, 6 oz.; minced shallots, 1 oz.; Cayenne pepper, 2 drm. Let it stand for 2 weeks.

Hygienic Vinegar.—Brandy, 1 pt.; otto of

cloves, 1 drm; otto of lavender, 1 drm.; otto of marjoram, ½ drm.; gum benzoin, 1 oz.; *macerate* these together for a few hours, then add brown vinegar, 2 pt.; and strain or filter if requisite to be bright.

Marseilles Vinegar.—Four Thieves' Vinegar, Prophylactic Vinegar, *Vinaigre des Quatre Voleurs, Acetum Quator Furum.* The original formula for this once celebrated preparation is:

Rosemary tops, dried	4	oz.
Sage flowers, dried	4	oz.
Lavender flowers, dried	2	oz.
Rue, fresh	1½	oz.
Camphor, dissolved in spirit	1	oz.
Garlic, sliced	¼	oz.
Cloves, bruised	1	drm.
Distilled wine vinegar, strongest	1	gal.

Digest for 7 or 8 days, with occasional agitation, pour off the liquor, press out the remainder, and filter the mixed liquids.

It is said that this medicated vinegar was invented by four thieves of Marseilles, who successfully employed it, as a prophylactic, during a visitation of pestilence.

Raisin Vinegar.—One cwt. of the marc left from making raisin wine, to every 12 or 15 gal. of water, along with a little yeast.

Raspberry Vinegar.—1. Bruised ripe raspberries, 3 pt.; white wine vinegar, 3 pt.; macerate for three days, press, strain, and to each pint add 1 lb. white sugar. Boil, skim, cool, and bottle at once; two oz. of brandy to each pint is sometimes added. Cherry and strawberry vinegar may be made in a similar manner.

2. Bruised ripe raspberries and white wine vinegar of each 3 pints; macerate for 3 days, press, strain, and to each pint add 1 lb. of white sugar. Boil, skim, cool, and bottle at once. Some persons add 2 fl. oz. of brandy to each pint.

3. Fresh raspberries, 3 lb.; good vinegar, 2 lb.; macerate in glass for two weeks, then strain without pressure. In a similar manner strawberry vinegar, cherry vinegar, and the vinegars of like fruits may be made.

4. Add ½ pt. good vinegar to every qt. of raspberries, and let them soak for two or three days; then bruise the berries, express the liquid, and to each pt. add 1 lb. of sugar. Boil it for twenty minutes, skim it, and when thoroughly cool, bottle it.

5. Take any quantity of ripe red raspberries, place them in a stoneware jar and add white wine or pure cider vinegar just sufficient to cover them; cover the jar closely and set aside for five or six days in cool situation to infuse. Now remove the surface carefully and filter the liquid; add an equal quantity of sirup at 36° of strength; mix well together, bottle and keep in a cold place. When used dilute with water or with any kind of aerated mineral waters.

Vinaigre a la Rose.—Concentrated acetic acid, 1 oz.; otto of roses, ½ drm. Well shaken together.

Sugar Vinegar.—Four lb. of brown sugar to each gal. of water.

Spiced Vinegars.—The following are given by the *Mineral Water Trades Review:*

For Gherkins.—

Good malt vinegar	1	gal.
Black peppercorns	6	oz.
Sliced ginger	4	oz.
Chillies	1	oz.
Garlic, in slices	1	oz.

Boil the spices and garlic gently in half the vinegar for half an hour, strain through a sieve, and add the rest of the vinegar to the spices and again strain. To the remnant spices add 2 oz. of salt and 1 pt. of water, and boil for half an hour. After removing from the fire add 1 pt. of vinegar, and again strain into the spiced vinegar, which when perfectly cold may be poured over the gherkins.

For Walnuts (to be used hot).—

Good malt vinegar	2	gal.
Black peppercorns	½	lb.
Ginger, unbleached	6	oz.
Mustard seed	1	lb.
Cloves	2	oz.
Mace	2	oz.
Garlic, in slices	2	oz.

In 1 gal. of vinegar boil the whole of the spices, and having strained, pour the hot liquor over the walnuts, then boil the remaining gal. of vinegar and pour over spices, etc. This pickle takes some time to mature, but if properly prepared should be ready for use in three months.

For French Beans.—

Distilled or very pale malt vinegar	1	gal.
White peppercorns	4	oz.
Bleached ginger (sliced)	2	oz.
Chillies	1	oz.

Into ½ gal. of the vinegar place the whole of the spices and allow to macerate for twelve hours, then simmer (do not boil) gently for one hour in an enameled pan, covering the top. To be used hot.

Sulphuric Acid in Vinegar, to Detect.—We have received so many letters on this subject that we are compelled to decline publishing many good methods which our correspondents have forwarded. The following, however, will give housekeepers, and others to whom chemical processes are not accessible, an opportunity of testing the purity of the article. The following is Fresenius' test, simplified for general purposes: Put a wineglassful of the vinegar into a china tea cup, and let the cup float in water in a pt. cup of tin or other metal that will stand heat. Boil the water till half the vinegar has evaporated, then drop into the cup a piece of (cane) loaf sugar about the size of a grn. of wheat. Continue the boiling till the liquid in the cup has evaporated, when, if the vinegar contains free sulphuric acid, the dry residue will be found to be blackened. The charring of the sugar is due to free sulphuric acid.

Tarragon Vinegar.—Put fresh tarragon leaves in a stone jar; add sufficient best wine vinegar to cover them. Keep in a warm place for two weeks; strain through cloth.

Toilet Vinegar (a la rose).—1. Dried rose leaves, 4 oz.; esprit de rose triple, ½ pt.; white wine vinegar, 2 pt. Macerate in a close vessel for two weeks, then bottle.

2. A la Violette.—

Extract of cassie	½	pt.
Extract of orris	¼	pt.
Esprit de rose, triple	¼	pt.
White wine vinegar	2	pt.

Whisky Vinegar.—Whisky, 1 pt.; sugar, 2 oz.; yeast a dessertspoonful.

Violet Alloy. See **Alloys.**

Violet Powder. See **Powders.**

Violet Water. See **Waters.**

Violin Bows, to Clean. See **Cleansing.**

Violins, Varnish for. See **Varnishes.**

Vitriol.—Blue, name for copper sulphate.
Green, name for copperas or iron sulphate.
Oil of vitriol, name for sulphuric acid.
White Vitriol, name for zinc sulphate.

Vulcanite, to Cement. See **Cements.**

Vulcanite, to Polish. See **Polishing.**

Vulcanite, to Preserve.—Wash with ammonia and rub with kerosene.

Wafers.—*Flour Wafers.*—1. Mix fine wheat flour with water to a smooth pap, add coloring as required, pass the mixture through a sieve to remove any clots or lumps, fill the wafer irons (previously warmed and greased with

butter or olive oil) with the batter, close them tight and expose them for a short time to the heat of a clear charcoal fire. The whole must then be allowed to cool, when the irons must be opened and the thin cake, which is now hard and brittle, must be cut into wafers by means of sharp annular steel punches. The wafer irons consist of two plates of iron, united together in a similar manner to a pair of pincers or tongs, and which when closed, leave a space between their internal surface proper for the thickness of wafers.

2. *Gelatine Wafers, Glue Wafers, Transparent Wafers.*—Dissolve isinglass or the best pale glue in sufficient water to form a consistent mass when cold, pour it while hot upon the surface of a warm plate of mirror glass, slightly oiled, and surrounded with a border of card paper, laid flat; next apply a similar plate, also warmed and oiled, and press the two into as close contact as is permitted by the card paper. When cold the thin cake of gelatine must be removed and cut into wafers with punches as before.

Walker's Metals. See **Alloys,** *Fusible.*

Walks, Gravel and Tar.—Take 2 parts very dry lime rubbish and 1 part coal ashes, also very dry, and both sifted fine. In a dry place, on a dry day, mix them, and leave a hole in the middle of the heap as bricklayers do when making mortar. Into this pour boiling hot coal tar, mix, and when as stiff as mortar put in 3 in. thick where the walk is to be; the ground should be dry and beaten smooth; sprinkle over it coarse sand. When cold, pass a light roller over it; in a few days the walk will be solid and waterproof.

Wall Papers to Clean. See **Cleansing.**

Walls, Damp, Remedy for.—Three-quarters lb. of mottled soap to 1 gal. of water. This composition to be laid over the brick work steadily and carefully with a large flat brush, so as not to form a froth or lather on surface. The wash to remain twenty-fours hours, to become dry. Mix ½ lb. alum with 4 gal. water; leave it stand twenty-four hours, and then apply it in the same manner over the coating of soap. Let this be done in dry weather.

Walls, Smoky, to Restore. See **Cleansing.**

Walnut (Doors), to Restore.—It will be necessary to first remove the shellac. Much of it may be removed with a little ammonia water and alcohol; but it is best to scrape off the last portions, and sandpaper the wood. If the wood is genuine walnut, a little oil will then bring out the color, and it may be finished with a good coat of copal varnish. If the doors are of imitation walnut, make solution of 2½ oz. Vandyke brown in a boiling solution of 1½ oz. washing soda in 1 qt. water, and add to it about ¼ oz. powdered bichromate of pottassa. Stir well together and when cool strain through a cloth for use. This will give you an excellent imitation of dark walnut; and when dry, it takes a good coat of varnish.

Walnut Stain. See **Staining,** *Wood.*

Warne's Metal. See **Alloys.**

Warts.—A wart is a hypertrophy or overgrowth of the papillæ of the skin, and the epidermis covering them. There are four varieties: Children's warts, venereal warts, senile warts and common warts.

Children's warts grow principally on the hands and face of children.

Treatment: Apply strong soda and water for a few days, and then paint them with æthereal tincture of tannin. Or, having covered the skin around the wart thickly with lard, apply over the surface of the growth 1 or 2 drops of strong hydrochloric or nitric acid; then keep the part covered up until the eschar or scab separates.

Common Warts.—Treatment as for children's.

Senile Warts.—These occur on the skin of elderly persons; they are often the commencement of a form of cancer known as epithelioma.

Treatment: Years of pain and perhaps a premature death may be avoided if the part is thoroughly destroyed with strong acid. If the patient is afraid to do it himself, let him go to a doctor.

If, after removal, these growths should show a tendency to return, they may be freely touched with nitrate of silver; or—

Muriatic acid	1	drm.
Muriated tincture of iron	3	drm.

Three other applications may be mentioned—acid nitrate of mercury, creosote, and diacetate of lead lotion.

After warts have been removed, their situation is often marked by more or less visible cicatrix; this, however, being far less unsightly than the wart itself. Hence, when these growths occur on the faces of children, especially girls, they may be left alone for a year or two, as they often disappear of themselves. Also it will be better, in these cases, to try soda and tannin remedy already spoken of, before proceeding to severer measures. The situation of the growth, and the sex of the child, should always be prominent factors in an argument as to treatment.

Wart Pomade.—

1. Soap cerate	2	oz.
Powdered savin	2	drm.
Powdered verdigris	2	drm.

Spread the pomade on leather the size of the wart, keep it on overnight and repeat if necessary.

2. Use a strong solution of chromic acid, applied three or four times. It is said that repeated applications of whale oil will cause warts to disappear.

3. Warts may be removed by coal oil (kerosene, applied twice daily.

4. Castor oil constantly applied from 2 to 4 or 6 weeks each day—that is, once a day—it has not failed in my hands, says the writer, in any case of any size or long standing. The time it takes may try the patience of the user, but if faithfully used they will get their reward in the removal of the wart without leaving any scar.—*Therapeutic Gazette.*

Warts, to Remove. See also **Escharotics.**

Washes for the Teeth. See the **Teeth.**

Wash, Black.—Charcoal, plumbago and size.

Wash, White. See **Whitewashes.**

Wash, for Woodwork.—An iron wash for woodwork can be made by taking fine iron filings, 1 part; brickdust, 1 part, and ashes 1 part. Put them in glue water, warm, and stir well together. Use two coats.

Washing Powder.—A powdery mixture composed of effloresced soda, 90 parts; hyposulphite of soda, 10 parts; and borax, 2 parts.

Universal Washing Powder.—This powder consists of silicate of soda, with a small percentage of powdered soap and starch. See **Powders,** also **Cleansing.**

Washing. See **Cleansing.**

Wastes, Photographic. See **Photography.**

Watch Hands, to Make Red.—Mix to a paste over a lamp, 1 oz. carmine, 1 oz. chloride of silver and ½ oz. of tinners' japan. Put some of the paste on the hands, and lay them face upward on a sheet of copper, holding it over a spirit lamp until the desired color appears on them.

Watchmakers, Useful Notes for.—We find the following in a recent number of the *Watchmaker:*

Main Springs.—When a main spring is cleaned, most inexperienced workmen will take hold of one end and pull the spring about half its length straight out, to save time. This practice will break springs when nothing else will; and springs treated thus generally break after the watch has been delivered to the customer only a few days. Breaking into many pieces is owing to the acid in the oil which is used. We will suppose the main spring is a fine one, and has been evenly tempered and properly cleaned; if, now, old oil is used, or that of an inferior quality if fresh, the acid it contains will eat into the spring, and will finally destroy its texture. The coil nearest the center breaks first, and as it recoils it breaks every coil in the barrel, and sometimes each coil is broken twice. The spring has become so impregnated with acid that it has no life left.

To Purify Oil.—To make the oil pure, take a good sized bullet or other piece of lead which has a thick coating of lead rust, cut it up fine, put it into the oil, and let it stand for two weeks. This causes the acid to settle, and it then resembles milk at the bottom. Now pour off the top, and your oil is pure. Common clock oil can be treated in this manner and made better than some watch oil.

To Restore Luster.—If not too much darkened it may be restored by dipping the wheel in pure muriatic acid. Test your acid by dipping a piece of polished steel in it; if it destroys the polish, reduce the acid with rain water until it will not. Rinse the wheels well in water. This will also restore the polish to steel that has been blued by heat.

Grinding Glasses.—Provide two pieces of cork, one concave and one convex (which may be cut to shape after fitting to lathe). Take a copper cent or other suitable article and soft solder a screw to fit the lathe and then wax it to the cork; then get a twenty-five cent emery wheel, such as is used on sewing machines, and you have a complete outfit for cutting your watch glasses. Polish the edge on the zinc collar of the emery wheel, or use a piece of zinc to do it with emery. The other cork should be waxed to a penny and centered. The spectacle lenses may be cut on the same emery wheel, if the wheel is attached to lathe so as to revolve.

Another method is to take a common piece of window glass (green glass is the best) and make a grindstone of that; using the flat surface to grind on. Cement it on a large chuck, the glass being from 2 to 2·5 in. in diameter.

Any one not familiar with this method would be surprised to see how fast the glass is cut away, for either spectacles or watches. In grinding watch glasses put them flat on the chuck glass—not on the edge.

Some watchmakers are excusable for not keeping a full supply of watch glasses on hand all the time, when it is remembered that there are over four thousand different sizes.

Watchmakers' Oil. See **Oil.**

Water. For distilled, perfumed, mineral waters, etc., see **Waters.**

To Keep Water for Fire Purposes from Freezing.—Use plenty of salt in the water.

Odor of Water, to Prevent.—A handful of copperas to a barrel of water, which is for fire purposes, will prevent odors.

To Purify Water.—1. Sprinkle in powdered alum in the proportion of a tablespoonful to ten gallons. Stir it well together, and in a few hours all impurities will be found sent to the bottom.

2. Alum gives excellent results when it has been found desirable to clarify muddy or turbid waters. See also **Filters.**

Water, Simple Tests for.—General. Evaporate by gentle heat a small sample of the water nearly to dryness in a clean porcelain cup, moisten the residue with acetic acid, and add to a portion of it a few drops of strong hydrosulphuric acid—pure water saturated with the gas evolved by the action of dilute sulphuric acid on iron mono-sulphide; a black precipate indicates lead. Add to another portion of the dilute acetic acid solution a little pure hydrochloric acid; a white precipitate, which redissolves on diluting with boiling water, indicates lead. To the remainder of the solution add a few drops of dilute sulphuric acid and let it stand for a time; a white, heavy precipitate indicates lead.

1. Test for Hard or Soft Water.—Dissolve a small quantity of good soap in alcohol. Let a few drops fall into a glass of water. If it turns milky, it is hard; if not, it is soft.

2. Test for Earthy Matters or Alkali.—Take litmus paper dipped in vinegar, and if, on immersion, the paper returns to its true shade, the water does not contain earthy matter or alkali. If a few drops of syrup be added to a water containing an earthy matter, it will turn green.

3. Test for Carbonic Acid.—Take equal parts of water and clear lime water. If combined or free carbonic acid is present, a precipitate is seen, to which, if a few drops of muriatic acid be added, an effervescence commences

4. Test for Magnesia.—Boil the water to a twentieth part of its weight, and then drop a few grains of neutral carbonate of ammonia into a glass of it, and a few drops of phosphate of soda. If magnesia be present, it will fall to the bottom.

5. Test for Iron.—*a.* Boil a little nutgall and add to the water. If it turns gray or slate black, iron is present.

b. Dissolve a little prussiate of potash, and, if iron is present, it will turn blue.

6. Test for Lime.—Into a glass of water put two drops of oxalic acid and blow upon it. If it gets milky, lime is present.

7. Test for Acid.—Take a piece of litmus paper. If it turns red, there must be acid. If it precipitates on adding lime water, it is carbonic acid. If a blue sugar paper is turned red, it is a mineral acid.

Waterproof Blacking. See **Blacking.**

Waterproof Cement. See **Cements.**

Waterproof Gloves. See **Gloves.**

Waterproofing.—The art of rendering fabrics impervious to moisture has attained considerable importance, especially in the case of clothing materials. The manufacture of rubber goods, as well as the cuprammonium process, has been purposely left out, as these processes are complicated, and belong more properly to a book of processes than to a receipt book.

Boots, Waterproofing.—1. A coat of gum copal varnish applied to the soles of boots and shoes, and repeated as it dries until the pores are filled and the surface shines like polished mahogany, will make the sole waterproof, and it lasts three times longer. See also Leather below.

2.

Linseed oil	1 part.
Mutton tallow	½ lb.
Beeswax	⅛ lb.

Melt and mix thoroughly together and apply to the warm dry leather with a brush. A small quantity of ivory black is sometimes added to this mixture.

Brick Walls, to Waterproof.—Use boiled oil.

Fishing Lines, Waterproofing.—1. Two parts boiled oil, 1 part gold size, put in a bottle, shake well and it is ready for use. Apply with a piece of flannel, expose to the air and dry. After using the line two or three times it should have another coat, the application being repeated when necessary.

2. Apply a mixture of 2 parts boiled linseed oil and 1 part good size; expose to the air and dry.

Felt Hats.—1. The stuff of coarse hat bodies is imbued with drying oil, prepared by boiling 50 parts linseed oil with 1 part each of white lead,

litharge and umber. The felt to be dried in a stove and then polished by pumice; 5 or 6 coats of oil are required; the surface is at last varnished. When the hat is intended to be stiff, the fabric is to be impregnated, first of all with paste, then stove dried, cut into the desired shape, and pumiced repeatedly; lastly placed in a hot iron mould and exposed to strong pressure.

2. Remove lining of hat and paint the inside with Canada balsam, made hot. Hats made waterproof and not ventilated will bring on premature baldness; so punch a few small holes in the side.

3. Boil 8 lb. shellac, 3 lb. frankincense, and 1 lb. borax in sufficient water.

Leather.—1. Add to a boiling solution of common yellow soap, in water, solution of alum or alum cake (alumina sulphate) as long as a separation of white alumina soap takes place; allow the precipitate to subside, wash it with hot water, heat moderately for some time, to expel adhering water, and dissolve the semi-transparent mass in warm oil of turpentine. The solution may be applied by brush, or by dipping and rolling. Oil and colors may be added to the bath, and the substance dried in the air, or more rapidly in drying room at 90°-100° F. (32°-38° C.), with care to prevent fire.

2. Best white or yellow wax.....	100 oz.
Burgundy pitch.....	6 oz.
Ground nut oil	8 oz.
Iron sulphate.....	5 oz.
Essence of thyme.....	2 oz.

3. A method of waterproofing leather and raw hides, used in Southern Austria, is as follows: impregnate the substance with a gelatine solution, mixed with some mineral salt to coagulate the gelatine in the pores. The following mixtures can be used:

1,200 water, 15 gelatine, 5 potash bichromate.

4. One thousand five hundred water, 50 gelatine, 3d potash bichromate; the temperature of the solution may vary from 53° F. (10° C.) to boiling point. When the bichromate percentage is small, the liquor is used cold, and the leather or hide is immersed for twenty-four hours; as the proportion approaches the point of saturation, the temperature must approximate more nearly to boiling, and the time of immersion be reduced until it becomes momentary. The bichromate solution may be replaced by the following: 1,000 water, 10 gelatine, 100 lead acetate, 100 alum; in every case, after impregnation on one or both sides, the leather or hide should be dried, and dressed on both sides with paraffin.

5. For rendering hose of fire engines completely watertight, so as to withstand the greatest pressure, the hose, after being cleaned and dried, is impregnated with a mixture of 100 parts of glycerine and 3 parts of carbolic acid, which may be done either by drawing the hose through the liquid, or, better still, by brushing it well in. Thus treated, the hose preserves a certain degree of dampness, without, however, being liable to rotting in the least degree, and so suffering deterioration in quality and durability. The brass fittings of the hose are attacked only imperceptibly by the acid contained in the composition; but even this may be easily prevented by giving them before impregnation a coating of weak shellac varnish, or by greasing them well with tallow. The hose must be cleaned every time they have been used, dried, and impregnated anew with the liquid. The previous drying of the hose is, however, not necessarily esential, more especially in winter, when drying is slightly difficult; it suffices to let the water run well out of the hose.

6. For Boots and Shoes.—Apply to the soles as much copal varnish as they will absorb, and castor oil to the uppers. The castor oil does not prevent subsequent blacking.

7. One oz. beeswax; ½ oz. suet; 2 oz. olive oil; ½ oz. lampblack; melt the wax and suet in the oil, add the lampblack, and stir till cool; warm the shoes and rub in the compound.

8. Warm the boots by fire then apply and rub in paraffin wax; it is, however, apt to soil the stockings by being melted out by the heat of the feet. A saturated solution of paraffin wax in cold naphtha, applied cold, is perhaps better.

9. Mix together in a pipkin, on the fire, 2 parts tallow to 1 part of rosin, and having thoroughly warmed the boots, apply it, melted, with a painter's brush, till they will not soak in any more. If the boots are well polished before applying the mixture, they will polish afterward.

10. Take about 1 gill of Macintosh's India rubber waterproofing solution, dissolve it in 2 gills raw linseed oil, adding the oil to the solution gradually. With this liquor paint the boots, giving as many coats, at intervals of six or eight hours, to the leather as it will take in, which may be as many as 10 or 12. The prepared leather takes a brilliant polish.

11. To Render Leather, Paper, etc., Impermeable.—MM. Huleux and Dreyfus advise the employment of the following mixture, which operates according to the quantity and proportion of the materials added:

White or yellow wax, first quality	1000 grm.
Burgundy pitch.....	60 grm.
Oil of arachide.....	80 grm.
Sulphate of iron.....	50 grm.
Essence of thyme.....	20 grm.

Paper.—1. It is a well-known fact that cellulose is soluble in cuprous ammonia solution; paper, linen and other vegetable tissues laid therein undergo a sort of surface amalgamation of the fibers, which alters their absorbent powers. A sheet of paper so treated, and dried afterward, becomes impermeable to water, and this property is not effaced by subsequent boiling. Sheets of paper soaked in the solution and laid one upon the other and rolled, become amalgamated into a kind of cardboard, possessing great elasticity and cohesive power. The cuprous solution may be prepared by agitating copper filings in a closed vessel containing liquid ammonia of 0·88 sp. gr.

2. Dissolve 8 oz. alum and 3¾ oz. Castile soap in 4 pt. water, and 2 oz. gum arabic and 4 oz. glue, separately, in 4 pt. water; mix the solutions, heat slightly, dip in the single sheets, and hang up until dry.

3. Waterproofing pasteboard may be effected with a mixture of 4 parts slaked lime in 3 parts skimmed milk, with a little alum added. As soon as mixed, the pasteboard is brushed over with two successive coatings of the preparation, and thus becomes impervious to water.

4. Take pale shellac, 5 oz.; borax, 1 oz.; water, 1 pt. Digest at nearly the boiling point till dissolved, then strain. This forms also an excellent vehicle for water colors, inks, etc. If required quite transparent, the lac should be bleached as follows: Dissolve shellac in a lye of pearlash, by boiling; filter and pass an excess of chlorine gas through the solution, which will precipitate the white lac. Wash and dry the precipitate, and cast it if desired into sticks.

5. To make waterproof packing paper, dissove 1¾ lb. white soap in 1 qt. water. In another qt. of water dissolve 1½ oz. gum arabic and 5 oz. glue. Mix the 2 solutions, warm them, soak the paper in the liquid, and pass it between rollers, or simply hang up to dry.

6. Even old newspapers may be converted into waterproof roofing material by applying coats of hot coal tar with a brush, uniting two or more thicknesses.

7. Rendering paper impervious to grease and water. Parchment paper is plunged into a warm solution of concentrated gelatine, to which has been added 2½ to 3% glycerine, and allowed to dry. The resulting paper is impervious to grease. If desired to make a paper waterproof, the same parchment paper is dip-

ped in carbon bisulphide containing 1% linseed oil and 4% India rubber.

8. A strong, impervious parchment paper is obtained by thoroughly washing woolen or cotton fabrics, so as to remove gum, starch and other foreign bodies, then immersing them in a bath containing a small quantity of paper pulp. The latter is made to penetrate the fabric by being passed between rollers. Thus prepared, it is afterward dipped into sulphuric acid of suitable concentration, and then repeatedly washed in a bath of aqueous ammonia until every trace of acid has been removed. Finally, it is pressed between rollers to remove the excess of liquid, dried between two other rollers which are covered with felt, and lastly calendered. The product is suitable for diaphragms in dialytic operations.

9. Treat the tissue to be waterproofed with chloride, sulphate, or other soluble salt or salts of zinc or cadmium, in conjunction with ammonia, applied in the form of a solution composed of about 3 parts crystallized zinc sulphate or 3 parts of a solution of zinc chloride at 96° Tw. (47° B.), and about 2 parts of a solution of ammonia of sp. gr. 0 875. The paper which it is proposed to treat is passed through a cistern lined with lead, and specially constructed for this purpose, with an arrangement of rollers, so as to allow the material to pass through at a speed varying from thirty to thirty-six yards per minute, according to the thickness. In its passage through the liquor, the material becomes perfectly saturated. From the bath it passes through a pair of squeezing rollers, which remove the superfluous liquor, and harden it by compression. From the rollers it is next passed to a suspending apparatus, then hung along the room in folds in a temperature of 110° F. (43° C.), until it is sufficiently dry to be taken down. The rollers in the cistern, the squeezing rollers, and the suspending apparatus are so speeded that the material is taken from one to the other without any inconvenience or stoppage.

10. Treat with glue, gelatine, or other similar substances, in conjunction with bichromate or chromate of potash, soda or alumina, applied in the form of a solution of about 1 part glue or gelatine in about 8 parts of water at 160° F. (71° C.) and a solution of 1 part potash bichromate in 15 parts of water. The mode of treatment in this case differs from 9 only in two points.

a. During the time the material is traversing the bath, as already described, the solution is maintained at 160 F. (71° C.) by means of siphon pipes charged with steam

b. Instead of suspending to dry, the material is immediately passed over three steam cylinders 7 ft in diameter, carrying a pressure of 15 to 20 lb. to the square inch. The cylinders are provided with gauges to indicate the pressure they are required to carry, and also with safety valves to prevent this pressure from being exceeded. The bath must always be kept in a state of darkness.

11. The paper is treated with acetate, sulphate or chloride of alumina, applied in the form of a solution of 1 part of any of these compounds in 6 parts of water at 160° F. (71° C.). The same conditions are required to produce a waterproof material with these compounds as those described in 9 and 10, with this difference, that it is not absolutely necessary to preserve darkness during the process.

Waterproof Paper Varnishes.—12. Pulverize 1 lb. shellac and put it into a bottle with a sufficient quantity of alcohol to cover the resin; cork the bottle tightly, and keep it in a warm place until the resin is dissolved. To 1 qt. of the liquid add 1 oz. ivory black and ½ oz. camphor dissolved in alcohol. Apply with a varnish brush. If too thick to work well, thin with alcohol.

13. Jonnson's green vitriol is dissolved in water, a solution of soap is added to this, and the precipitate of iron soap which is formed is collected. When this precipitate has become dry, and is then dissolved in carbon bisulphide, or in benzole, a fluid is obtained which leaves behind a waterproof layer upon paper or tissue. If the paper or tissue is to remain white, a solution of alum is used instead of that of green vitriol, and a white aluminum soap is then obtained, which is used in the same manner.

14. Take 4 oz. clean gutta percha, dissolve in 1 lb. rectified rosin oil; add 2 lb. linseed oil varnish, boiling hot.

15. One part dammar resin; 4·6 parts acetone are digested in a closed flask for two weeks, and the clear solution is poured off. To this 4 parts collodion are added, and the whole is allowed to clear by standing.

16. Thirty parts white shellac are digested with 500 parts ether, and to the solution 15 parts lead carbonate are added; it is then shaken for some time and repeatedly filtered.

17. Five parts glue are dissolved in 100 parts warm water, and this solution is spread on paper. After drying, the paper is soaked for an hour in a 10% solution of alumina acetate and again dried, in order to give it a final glaze.

18. One hundred and twenty parts linseed oil are heated and poured into a mixture of 33 parts quicklime and 22 parts water, to which 55 parts melted rubber have been added, stirring all the time. The varnish is strained and used hot.

19. One part gutta percha is carefully digested in 40 parts benzene on the water bath, and the paper is covered with it. This varnish can be drawn or written on, and it does not render the paper transparent or spotted.

19. According to the *Journ. Soc. of Arts*, a strong, impervious parchment paper is obtained by thoroughly washing woolen or cotton fabrics, so as to remove gum, starch, and other foreign bodies, then to immerse them in a bath containing a small quantity of paper pulp. The latter is made to penetrate the fabric by being passed between rollers. Thus prepared, it is afterward dipped into sulphuric acid of suitable concentration, and then repeatedly washed in a bath of aqueous ammonia until every trace of acid has been removed. Finally, it is pressed between rollers to remove the excess of liquid, dried between two other rollers which are covered with felt, and lastly calendered.

20. Soak good paper in an aqueous solution of shellac and borax. It resembles parchment paper in some respects. If the aqueous solution be colored with aniline colors, very handsome paper is prepared, which is used for artificial flowers.—*Science Record*, 1875.

21. Melt in 10 pt. hot water, 30 oz. glue, gelatine, or size, and 3 oz. gum arabic. In another 30 pt. hot water melt 2 oz. of soap and 4 lb. alum. Mix both liquids together in one pot. This constitutes compound No. 1. In another pot heat ½ gal. benzol and 1 gal. paraffine, and melt in it 24 oz resin; let it boil until it attains a moderate degree of consistency. To these materials, resin, oil and copal or mastic varnish may, in some cases, be added. This is composition No. 2 First dip the article to be waterproofed into the composition No. 1, in a heated state, and then dry it. Next apply No. 2 in a cooled state with a brush or in any other convenient manner. Care should be taken to avoid igniting the benzol, as it is highly inflammable.

22. Packing paper may be made water-tight by dissolving 1·8 lb. of white soap in 1 qt. of water, and in another quart 1·8 oz. of gum arabic and 5·5 of glue. The paper is soaked in the mixture and hung up to dry.

23. Treat the paper with a mixture of camphor oil and linseed oil.

Pasteboard.—Waterproofing pasteboard may be effected with a mixture of 4 parts of slaked lime into 3 parts of skimmed milk, with a little alum added. As soon as mixed, the paste-

board is brushed over with 2 successive coatings of the preparation, and thus becomes impervious to water.

Textiles.—Without considering the methods by which cloth is waterproofed with rubber, there are several processes in practical use by which cloth is rendered non-absorbent of water—and for all practical purposes waterproof—without materially affecting its color or appearance, greatly increasing its weight, or rendering it entirely air proof. These depend mainly upon the reaction between two or more substances, in consequence of which a substance insoluble in water is deposited in the fibers of the cloth.

1. Lowry's Process.—Two oz. soap, 4 oz. glue, 1 gal. water. Soften the glue in cold water, and dissolve it together with the soap in the water by aid of heat and agitation. The cloth is filled with this solution by boiling it in the liquid for several hours, the time required depending upon the kind of fiber and thickness of the cloth. When properly saturated, the excess of liquid is wrung out, the cloth is exposed to the air until nearly dry, then digested for five to twelve hours in the following solution:

Alum	13 oz.
Salt	15 oz.
Water	1 gal.

It is finally wrung out, rinsed in clean water, and dried at a temperature of about 80° F. (27° C.).

2. Paut's process requires a small quantity of oil, but in other respects resembles the last. It is given as follows:

Sodium carbonate	1 lb.
Caustic lime	½ lb.
Water	2½ pt.

Boil together, let it stand to settle, then draw off the clear lye and add to it 1 lb. tallow, ½ lb. rosin, previously melted together. Boil and stir occasionally for half an hour, then introduce 3 oz. glue (previously softened), 3 oz. linseed oil and continue the boiling and stirring for another half hour. In waterproofing, ⅛ oz. of this soap is mixed with 1 gal. hot water, and in this the goods are soaked for about twenty-four hours, according to thickness and character. The pieces are allowed to drain until partly dried, then soaked for six hours or more in a solution prepared as follows:

Aluminum sulphate	1 lb.
Lead acetate	½ lb.
Water	8 gal.

Shake together, allow to settle, and draw off the clear liquid. Wring out after rinsing and dry at a temperature of 80° F. (27° C.).

3. Bienvaux uses instead of glue and oil as above, the gelatinous portion of sea wrack grass with a small quantity of a drying oil and common rosin soda soap.

4. In Reimann's process the cloth is passed slowly by machinery through a tank divided into three compartments, the first containing a warm solution of alum, the second a warm solution of lead acetate, and the third pure water, which is constantly renewed. The cloth, on passing from the latter, is brushed, and beaten to remove the salt adhering to the surface, and finally hot pressed and brushed. In this case lead sulphate is deposited in the fibers.

5. In Townsend's process two solutions are used as follows:

Dextrine	20 lb.
White soap	10 lb.
Water	16 gal.

The solution is boiled for some minutes, and if color is required, 1 pt. logwood liquor is added. The second solution consists of a saturated solution of alum in water or 6 lb. zinc sulphate, 9 gal. water.

6. Bullard's process is somewhat similar to Reimann's. In this strong aqueous solutions of aluminum sulphate and lead acetate are used alternately.

7. Berlin waterproof cloth is said to be prepared by saturating the cloth in a solution of aluminum and copper acetate, then dipping it successively in water glass and rosin soap.—*Sci. Am.*

8. A bath heated to 194° F. (90° C.) is made of 13¼ lb. liquid Bordeaux turpentine, 3¼ lb. tallow, 1 lb. wax, and ½ lb. storax; the articles are immersed for a few minutes, then passed between heated rollers to remove excess.

9. For some time past the Belgium War Department has conducted a series of experiments at Valvorde, on the waterproofing of soldiers' uniforms by means of liquid alumina. With respect to the hygienic side of the question, the medical authorities have satisfied themselves that the articles of dress thus treated permit the perspiration to pass off freely, and chemical analysis has proved that the preparation used in no way injures the materials or destroys their color. More than 10,000 yd. of materials, redressed 2 or 3 times over, notwithstanding the rinsing and washing to which they have been subjected after having been soiled, and after constant wear, remained perfectly waterproof. The only drawback to the process appears to be that it is not very economical, and, to insure the desired result, must be conducted on a large scale, which requires a considerable amount of plant. The following is the process employed; Alumina acetate is obtained by making solutions of equal parts of alum and lead acetate in separate vessels, and then mixing them together. Lead sulphate will be thrown down, leaving alumina acetate in solution, which must be decanted. The materials to be waterproofed are soaked in this solution, and then withdrawn without being wrung, and dried in the air.

10. Bellefroid produces an impermeable coating, which consists firstly of a solution of stearine pitch, one of the by-products of candle making, which pitch, in order to be used in the fabrication of the compound, is previously completely oxidized by exposure to the air. In order to complete this oxidization, the pitch is spread out in very thin layers, and exposed to the outer atmosphere for a period of at least two years. This exposure is absolutely necessary, judging from experiments repeatedly made. The solution is afterward effected in the following manner: A mixture consisting of 75 lb. stearine pitch, 150 lb. water, and 5 lb. caustic soda at about 35° to 36°, is put into a boiler or vessel of any suitable shape, having a second or double bottom so as to allow of the removal of impurities which will settle at the bottom of the vessel. The mixture is boiled for twelve hours over a strong fire, after which 52 pt. of water are added, and the boiling is continued for another twelve hours. The solution thus obtained is then poured out in an open vessel, and left exposed to the open air for eight days, for the purpose of being clarified, and enabling the impurities to settle at the bottom.

11. Piron has invented a process for tanning textile fabrics, which renders them waterproof, and at the same time, it is said, proof against decay, while their suppleness is not diminished, and their weight not appreciably increased. Arguing from the high state of preservation in which the bands which surround the heads of Egyptian mummies are found to this day, and which are impregnated with a kind of resin, Piron had recourse to the substance extracted from birch bark, and which is now used to perfume Russia leather. When the fine white bark of the birch tree is distilled, it yields a light oil, nearly ¼ of which consists of the special phenol, or carbolic acid, which gives the well-known odor to Russia leather. It is now found that the residue, or green tar of the birch, which is obtained from Kostroma, yields neither acid nor alkaloid, and it forms, with alcohol, a solution of great fluidity, which,

however, when once dried, is unacted upon by alcohol. It is this substance, which will unite with the most brilliant colors, that is used by Piron for treating textile fabrics. Not only dose it fill the capillary vessels, but it also coats them with a varnish of great elasticity, which is unattackable by acids and sea water, while it also stands great changes of temperature. The aromatic odor of articles thus treated drives away insects; there is no space for microscopic vegetation, and neither air nor water can penetrate into the tissues. This process is applicable to all vegetable products, such as sailcloth, cordage, blinds and awnings.

12. Sackcloth or canvass can be made as impervious to moisture as leather, by steeping it in a decoction of 1 lb. oak bark with 14 lb. boiling water. This quantity is sufficient for 8 yd. of stuff. The cloth has to soak for 24 hours, when it is taken out, passed through running water, and hung up to dry. The flax and hemp fibers, in absorbing the tannin, are at the same time better fitted to resist wear.

13. Waterproof Coat.—Isinglass, alum, soap, equal parts; water sufficient. Dissolve each separately, and mix the solution, with which imbue the cloth on the wrong side. Dry and brush the cloth well, first with a dry brush, and afterward (lightly) with a brush dipped in water.

14. For Awning or Apron.—Dissolve 1 oz. yellow soap in 1½ pt. water by boiling; then stir in 1 qt. boiled oil, and when cold add ¼ pt. gold size.

15. Seamen's Oilskins.—The material should be fine twilled calico, dipped in bullock's blood and well dried in a current of air; then 2 or 3 coats of raw linseed oil with a little gold size or litharge in it (say 1 oz. to 1 pt. of oil). Each coat should be allowed to dry thoroughly before the next is put on (as before in a current of air, care being taken to shelter it from both sun and rain). Oilskins made in this way, both here and in the tropics, have stood for years.

16. Waterproofing Linen or Calico—The Manner in Which Sea Fisherman do Coats and Leggings.—Whatever the article is, let it be stretched on a table. Make very thick paint of whatever color is wished. An invisible green is, perhaps, as good as any. Take a large lump of common brown soap, pretty freshly cut from a bar, in the left hand, and every time you replenish the brush with paint rub well on the soap, and take up as much as possible, and rub well on one surface of the calico or linen. It will take long to do, and should be hung in the windiest place you can find. Summer is the best time, but a month will see it in very usable order, and you will have as supple and perfectly waterproof garment as paint can make. After wearing a few times, a second coat would be advisable, which will dry in half the time of the first, and must be done in the same way.

17. For Canvas.—A solution containing equal parts by weight of gelatine and chrome alum. It is not advisable to mix more of the solution at once than is sufficient to give the canvas one coat, as, if the mixture once sets, it cannot be reliquefied like a plain solution of gelatine, and hence, if the quantity of canvas to be waterproofed is but small, it would, perhaps, be preferable to coat with plain gelatine solution until quite impervious to cold water, and then to thoroughly soak for, say, twenty-four hours in a strong solution of chrome alum.

18. For Sail Cloth.—Grind 96 lb. English ocher with boiled oil, and add to it 16 lb. black paint. Dissolve 1 lb. yellow soap in 1 pail of water on the fire, and mix it while hot with the paint. Lay this composition, without wetting it, upon the canvas as stiff as can conveniently be done with the brush, so as to form a smooth surface; the next day, or the day after (if the latter, so much the better), lay on a second coat of ocher and black, with a very little, if any, soap; allow this coat a day to dry, and then finish the canvas with black paint.

19. For Woolens.—Boil 4½ oz. white soap in 2½ gal. water, and separately dissolve 5¾ oz. alum in 2½ gal. water. Heat the two solutions to 190° F. (88° C.), pass the fabric first through the soap bath and then through the alum, and finally dry in the open air.

20. Oil Cloth. — The manner of making oil cloth or oil skin was at one period a mystery. The process is now well understood, and is equally simple and useful. Dissolve some good resin or lac over the fire in drying linseed oil, till the resin is dissolved, and the oil brought to the thickness of a balsam. If this be spread upon canvas or any other linen cloth, so as fully to drench and entirely to glaze it over, the cloth, if then suffered to dry thoroughly, will be quite impenetrable to wet of every description. This varnish may either be worked by itself or with some color added to it; as verdigris for a green; umber for a hair color; white lead and lampblack for a gray; indigo and white for a light blue, etc. To give the color, you have only to grind it with the last coat of varnish you lay on. You must be as careful as possible to lay on the varnish equally in all parts.

21. A better method, however, of preparing oil cloth is first to cover the cloth or canvas with a liquid paste, made with drying oil in the following manner: Take Spanish white or pipe clay which has been completely cleaned by washing and sifting it from all impurities, and mix it up with boiled oil, to which a drying quality has been given by adding a dose of litharge, ¼ the weight of the oil. This mixture, being brought to the consistence of thin paste, is spread over the cloth or canvas by means of an iron spatula, equal in length to the breadth of the cloth. When the first coating is dry, a second is applied. The roughness occasioned by the coarseness of the cloth or the unequal application of the paste are smoothed down with pumice, reduced to powder, and rubbed over the cloth with a bit of soft serge or cork dipped in water. When the last coating is dry, the cloth must be well washed in water to clean it; and, after it is dried, a varnish composed of lac dissolved in linseed oil boiled with turpentine is applied to it, and the process is complete. The color of the varnished cloth thus produced is yellow; but different tints can be given to it in the manner already pointed out. An improved description of this article, intended for printed and figured varnished cloths, is obtained by using a finer paste and cloth of a more delicate texture.

22. Varnished Silk.—This material, often employed for umbrellas, is prepared much in the same manner as 21, but with a paste composed of linseed oil boiled with ¼ litharge, 16 parts dried and sifted pipe clay, 3 parts of litharge very finely ground, dried, and sifted, and 1 part of lampblack. After washing the silk, fat copal varnish is applied instead of that used for oil cloth.

23. For Linen.—A solution of alumina sulphate in 10 times its weight of water, and a soap bath of the following composition: 1 oz. light colored rosin and 1 oz. crystallized soda are boiled in 10 oz. water until dissolved. The rosin soap is precipitated with ½ oz. table salt, and is subsequently dissolved along with 1 oz. white curd soap in 30 oz. hot water. It should be put in wooden tubs for use. On made up articles, the two solutions can be applied with a brush and then rinsed off.

24. Parone, of Turin, proposes the following method of rendering textures waterproof: In 14 pt. water, heated to about 180° F. (82° C.), dissolve 10½ lb. gelatine and 21 lb. castor oil soap; then add 10½ lb. lac, shaking the liquid till the lac is completely dissolved. Take it off the fire, and add to the mixture in small quantities at a time 21 lb. powdered alum, shaking it till the alum is dissolved. The liquid thickens, forming an insoluble alumina soap which remains closely incorporated with the gelatine

and lac. It is spread over the textures with a brush.

25. Cooley gives the following recipe for waterproofing, which appears to have the advantage of having been tried with success: A simple method of rendering cloth waterproof, without being airproof, is to spread it on any smooth surface, and to rub the wrong side with a lump of beeswax (perfectly pure and free from grease), until it presents a slight, but even, white or grayish appearance; a hot iron is then passed over it, and, the cloth being brushed while warm, the process is complete. When this operation has been skilfully performed, a candle may be blown out through the cloth, if coarse, and yet a piece of the same placed across an inverted hat may have several glassfuls of water poured into the hollow formed by it, without any of the liquid passing through. Pressure or friction will alone make it do so.

26. For Canvas.—The following is highly recommended as a simple and cheap process for coating canvas for wagon tops, tents, awnings, etc. It renders it impermeable to moisture, without making it stiff and likely to break. Soft soap is dissolved in hot water, and a solution of iron sulphate added. The sulphuric acid combines with the potash of the soap, and the iron oxide is precipitated with the fatty acid as insoluble iron soap. This is washed and dried, and mixed with linseed oil. The soap prevents the oil from getting hard and cracking, and at the same time water has no effect on it.

27. Waterproofing Oil.—Take 20 oz. lard oil, 10 oz. paraffin, 1 oz. beeswax; heat the oil over a slow fire, and when hot add the paraffin and wax; allow the whole to remain over the fire until the latter articles are melted, and add a few drops of sassafras oil or other essential oil to preserve it.

28. Sailcloth Impervious to Water, yet Pliant and Durable.—Grind 6 lb. English ocher with boiled oil, and add 1 lb. black paint, which mixture forms an indifferent black; 1 oz. yellow soap dissolved by heat in ½ pt. water, is mixed while hot with the paint. This composition is laid upon dry canvas as stiff as can conveniently be done with the brush. Two days after, a second coat of ocher and black paint (without any soap) is laid on, and, allowing this coat time to dry, the canvas is finished with a coat of any desired color. After three days it does *not* stick together when folded up. This is the formula used in the British navy yards, and it has given excellent results. A portable boat may be made of canvas prepared in this way, and stretched on a skeleton frame.

29. For Woolen Cloth.—Four oz. powdered alum, 4½ oz. sugar of lead, dissolved in 3 gal. water, stirred twice a day for two days. When perfect subsidence has taken place, pour off the clear liquid only, and add to it 2 drm. isinglass, previously dissolved in warm water, taking care to mix thoroughly. Steep the garments in this mixture for six hours, after which hang up to drain and dry. Wringing must be avoided. This recipe is used by woolen cloth waterproofers.

30. Dujardin's process for all kinds of textiles is as follows: Place in a mortar 12 oz. alumina and potash sulphate reduced to powder and 12 oz. lead acetate; bray till the mixture is quite deliquescent. Add 7 oz. pulverized potash bicarbonate and 7 oz. soda sulphate; bray till completely combined. Pour in 4¼ oz. calcined magnesia, and continue braying while adding 8¾ pt. water. Pour the whole into a bucket containing 11 gal. river or rain water, which must be fresh. Shake the whole until there is complete solution, which takes place in 20 minutes. Pour the liquid thus obtained into a convenient receptacle holding about 22 gal., in which have been dissolved 5¼ lb. oleine soap in 11 gal. rain or river water. Boil for about 20 minutes. To render a texture waterproof, it is then sufficient to put in this liquid either by hand or machinery, until it is perfectly impregnated in all its parts. Care must be taken during the whole operation to stir the mixture well, that no deposit may be formed. The texture is then withdrawn, left to drip, and dried. It is afterward washed in plenty of water, dried, and dressed as usual. In this condition the texture is waterproof, but penetrable by air, which is indispensable for health. This process does not alter tints at all, but if the materials have very delicate tints, it is necessary to take account of the composition of these colors, and compose the bath accordingly. The potash bicarbonate and soda sulphate must then be sometimes replaced by the same quantity of salts of iron, copper, zinc, lead, or some other metallic salt suitable for preserving colors. To prepare linen, leather, or wood, add 3½ oz. margarine to the bath. When it is desired to prepare cotton or paper, it is well to add to the bath 1¼ oz. gelatine and 3½ oz. light colored rosin. After that, dry in the open air or at the fire, and the products will be perfectly impermeable, and resist every kind of washing. Paper paste may be even soaked in the vat, and thus an impermeable paper obtained, the above process replacing the sizing.

31. The following mixture is given by a correspondent in *L'Industrie Textile* as suitable for waterproofing all kinds of woven fabrics:

Linseed oil	77·0	parts.
Acetate of lead	1·845	part.
Litharge	10·0	parts.
Amber earth	0·4	part.
Vegetable wax	1·3	part.
Soap powder	1·2	part.
Manila gum	0·7	part.
Lampblack	4·0	parts.
Essence of turpentine	2·0	parts.
India rubber varnish	1·555	part.
Total,	100	parts.

32. Cloth coated with linseed oil to which a little wax and litharge have been added will be waterproof.

33. Saturate the goods with a strong hot aqueous solution of good resin soap, and then wring, transfer, and digest them in a second bath of alum or aluminum sulphate or acetate dissolved in hot water. Rinse and dry thoroughly at a temperature of about 80° F. Thus treated the fibers do not readily absorb water, but the goods are not absolutely waterproof.

34. A new waterproofing compound for fabrics is made as follows: In 14 parts of water, heated to 180° F., dissolve 10¼ lb. gelatin and 21 lb. castor oil soap. Then add 10½ lb. gum lac, shaking the liquid until the last is completely dissolved. Remove from the fire, and add in small quantities 21 lb. powdered alum until the alum dissolves. This forms an insoluble alumina soap, closely incorporated with the gelatin and the gum lac. Apply with a brush.

35. Boiled oil	15	lb.
Beeswax	1	lb.
Ground litharge	13	lb.

Mix and apply with a brush to the article, previously stretched against a wall or table, washing and drying each article well before applying the composition.

Umbrellas.—First sponge the cloth on both sides with a solution of 1 part sulphate of alumina in 10 parts water, then with a solution of soap, which is prepared by boiling 1 part light colored resin and 1 part of crystallized carbonate of soda with 10 parts water, until the resin is dissolved. The resin soap thus formed is to be separated by the addition of common salt. This soap is then dissolved, together with 1 part soda soap, by boiling in 30 parts water. After this last sponging, rinse in the rain.

Wood.—Dry the wood and saturate with hot paraffine oil or paraffine melted.

Waterproof Varnish. See **Varnishes.**

Waterproof Whitewash. See **Whitewashes.**

Waters (Distilled, Mineral, etc.). Including the French *Eaux*, *Aerated Waters.*—Salts for Producing Factitious Mineral Waters.—*Aerated or Carbonated Waters.*—These require the aid of the powerful machine employed by soda water manufacturers, to charge the waters strongly with carbonic acid gas. The gas is made from marble dust and diluted sulphuric acid, and is forced by a pump into the watery solution. Sometimes the gas is produced by the mutual action of the ingredients introduced into the bottle of water, which must be instantly closed; but this method is found practically inconvenient, and is only adopted in the absence of proper apparatus. The quanity of gas introduced is directed, in the French and American pharmacopœias, in most cases, to be 5 times the volume of liquid. For chalybeate and sulphureted waters the water should be previously deprived of the air it naturally contains, by boiling, and allowing it to cool in a closed vessel.

For the different mineral waters see the names, as *Ems* water. The following are miscellaneous waters:

Simple Aerated Water.—Carbonic acid gas water. Water charged with 5 or more volumes of carbonic acid gas, as above.

Alkaline Aerated Waters.—Aerated soda and potash waters should be made by dissolving a drm. of the carbonated alkali in each pt. of water, and charging it strongly with carbonic acid gas. The soda water of the shops generally contains but little (or no) soda.

Aerated Magnesia Water.—This is made of various strengths.

Mialhe's Aerated Chalybeate Water.—Water, 1 pt.; citric acid, 1 drm.; citrate of iron, 15 grn.; dissolve, and add 75 grns. of bicarbonate of soda.

Trosseau's Martial Aerated Water.—Potassio-tartrate of iron, 10 grn.; artificial seltzer water, 1 pt.

Bouchardat's Gaseous Purgative.—Phosphate of soda, 1½ oz.; carbonated water, 1 pt.

Mialhe's Iodureted Gaseous Water.—Iodide of potassium, 15 grn.; bicarbonate of soda, 75 grn.; water, 1 pt.; dissolve and add sulphuric acid, diluted with its weight of water, 75 grn. Cork immediately.

Dupasquier's Gaseous Water of Iodide of Iron.—Solution of iodide of iron (containing ⅛ of dry iodide), 30 grn.; syrup of gum, 2½ oz.; aerated water, 17½ oz.

Murray's and Dinneford's Fluid Magnesia may be thus made: To a boiling solution of 16 oz. of sulphate of magnesia in 6 pt. of water add a solution of 19 oz. of crystallized carbonate of soda in the same quantity of water; boil the mixture till gas ceases to escape, stirring constantly, then set it aside to settle; pour off the liquid, and wash the precipitate on a cotton or linen cloth, with warm water, till the latter passes tasteless. Mix the precipitate, without drying it, with a gal. of water, and force carbonic acid gas into it under strong pressure, till a complete solution is effected. The eau magnesienne of the French codex is about a third of this strength; and we have met with some prepared in this country not much stronger.

Aix La Chapelle Water.—

Bicarbonate of soda	12	grn.
Chloride of sodium	25	grn.
Chloride of calcium	3	grn.
Sulphate of soda	8	grn.
Simple sulphureted water	2½	oz.
Water, slightly carbonated	17½	oz.

Eau d'Ange, Angel Water, Portugal Water.—

Eau de rose	½	pt.
Eau de fleurs d'oranges	½	pt.
Eau de myrtle	¼	pt.
Essence of ambergris	2	fl.drm.
Essence of musk	1	fl.drm.

Agitate them briskly together for some hours, and again, frequently, for a few days, observing to keep the bottle (closely stopped) in a warm room the whole time. Lastly, after repose, decant the clear portion, and, if necessary, filter the liquid through white bibulous paper. Nearly colorless. See also *Portugal Water.*

Eau d'Ange, Distillée.—

Gum benzoin (crushed small)	4	oz.
Liquid styrax	2	oz.
Cloves (bruised)	½	oz.
Calamus aromaticus (bruised)	¼	oz.
Cinnamon (bruised)	¼	oz.
Coriander seed (bruised)	1	drm.
Water	7	pt.

Distill ½ gal.

Eau des Alpes.—

Alcohol	400	parts.
Oil of bergamot	9½	parts.
Oil cedrat	9½	parts.
Oil of orange blossoms	9½	parts.
Portugal oil	¾	part.
Oil of lemon	¾	part.
Oil of wormwood	2	parts.
Oil of cloves	1	part.

Eau Spiritueuse d'Anis.—

Angelica seed	6	oz.
Anise	6	oz.
Brandy	8	lb.

Bruise the seeds, and after some days' infusion with the brandy, distill.

Apple Water.—Slice two large apples, put them into a jar, and pour over them 1 pt. of boiling water. Cover close for an hour; pour off the fluid, and sweeten if necessary.

Aromatic or Perfumed Waters.—The finest of these, such as are generally used by perfumers, are prepared by distillation, and are strictly pure water impregnated with the odoriferous principles of the plant or substance from which they are distilled. Those in use for pharmaceutical purposes are, generally, solutions of these principles, chiefly the essential oils, in distilled water, usually prepared by trituration with the water by means of some suitable intermedium, and then filtered.

Aquariums, Sea Water (Artificial) *for.*—1. The following mixture will form a tolerably good substitute. It so nearly assimilates to the actual composition of salt water that it will support life in the marine aquarium:

Common salt (chloride of sodium)	3½	oz.
Epsom salts (sulphate of magnesia)	¼	oz.
Chloride of magnesium	200	gr. troy
Chloride of potassium	40	grn.
Soft water	4	qt.

2. Chloride of sodium	81	grm.
Sulphate of magnesium	7	grm.
Chloride of magnesium	10	grm.
Chloride of potassium	2	grm.
Water	3 to 4	liters.

—*Pharm. Era.*

3.	Parts by Weight.
Water	70,000
Chloride of sodium	1,045
Sulphate of lime	101
Sulphate of magnesium	165
Chloride of magnesium	263·5
Chloride of potassium	55
Carbonate of lime	5·89
Bromide of magnesium	2·8
Carbonate of lime	2·3
Carbonate of magnesium	1·522
Silica	1·039
Sulphate of magnesium	0·322
Oxide of iron and alumina	0·154
Chloride of sodium	1·407
Nitrate of magnesium	0·35
Nitrate of sodium	0·283
Chloride of potassium	0·042

The repetition of some of the substances in the above recipe can be explained by saying that the water at the marine aquarium, Birmingham, contained the substances named from 9 to 17 in the quantities given there. He actually introduced only those from 2 to 8. He aims at securing a density of 1,027, at a temperature of 60° F. The weight given may be taken as grains, ounces, pounds or tons, according to the quantity required.

Baden.—

Magnesium chloride	2	gr.
Calcium chloride	40	gr.
Iron perchloride	¼	gr.
Sodium chloride	30	gr.
Sodium sulphate	10	gr.
Sodium carbonate	1	gr.
Water	1	pt.
Carbonic acid gas	5	vol.

Balaruc Water.—

Chloride of sodium	1	oz.
Chloride of calcium	1	oz.
Chloride of magnesium	½	oz.
Sulphate of soda	3	drm.
Bicarbonate of soda	2	drm.
Bromide of potassium	1	grn.
Water	1	gal.

Chiefly used for baths.

Balm Water.—

Flowering tops of balm (fresh)	1½	lb.
Lemon peel (fresh)	4	oz.
Cinnamon (bruised)	2	oz.
Cloves (bruised)	2	oz.
Nutmegs (bruised)	2	oz.
Coriander seed (bruised)	1	oz.
Angelica root (dry, bruised)	1	oz.
Rectified alcohol	5½	pt.

Macerate eight days, and distill to dryness by the heat of a water bath. These are the proportions of the Paris Codex. This spirit is highly esteemed in France as a cosmetic, stomachic and stimulant.

Bareges Water. (*Cauterets, Bagneres de Luchon, Eaux Bonnes, St. Sauveur* may be made the same.)—Crystallized hydrosulphate of soda, crystallized carbonate of soda, and chloride of sodium, of each 1½ grn.; water (freed from air), 1 pt. A stronger solution for adding to baths is thus made: Crystallized hydrosulphate of soda, crystallized carbonate of soda, and chloride of sodium, of each 2 oz.; water, 10 oz.; dissolve. To be added to a common bath at the time of using.

Barley Water.—Two tablespoonfuls of barley, 2 qt. of water, 1 tablespoonful of sugar. Wash the barley well; put the barley and water into a saucepan and bring it to a boil; then boil very slowly for two hours, strain it, add sugar, and let it cool. Barley water is very cooling and nourishing. The barley may afterward be used for a pudding, or put into soup.

Bussang, Forges, Provins, and other similar waters, may be imitated by dissolving from ½ to ⅔ of 1 grn. of sulphate of iron, 2 or 3 grn. of carbonate of soda, 1 grn. of sulphate of magnesia, and 1 grn. of chloride of sodium, in 1 pt. of aerated water.

Carbolic Toilet Water.—

Crystallized carbolic acid	10	parts.
Essence millefleurs	1	part.
Tincture quillaya saponaria	50	parts.
Water	1,000	parts.

Mix. The saponine replaces soap with advantage. The above should be employed, diluted with 10 times its bulk of water, for disinfecting the skin, for washing the hands after any risk of contagion, etc.

The tincture of saponine in the above is made by taking of bark of quillaya saponaria, 1 part, and of alcohol, 90°, 4 parts. Heat to ebullition, and filter.

Carlsbad Water.—

Chloride calcium	8	gr.
Tincture chloride iron	1	drop.
Sulphate soda	50	gr.
Carbonate soda	60	gr.
Chloride sodium	8	gr.
Carbonated water	1	pt.

Chalybeate Water (Simple).—

Water freed from air by boiling	1	pt.
Sulphate iron	½	gr.

Aerated Chalybeate Water.—

Sulphate iron	1	gr
Carbonate soda	4	gr.
Water deprived of air and charged with carbonic acid gas	1	pt.

Dr. Pereira recommends 10 grn. each of sulphate of iron and bicarbonate of soda to be taken in a bottle of ordinary soda water. This is equivalent to 4 grn. of carbonate of iron.

Brighton Chalybeate.—

Sulphate iron	2	gr.
Chloride sodium	2	gr.
Chloride calcium	2	gr.
Carbonate soda	3	gr.
Carbonated water	1	pt.

Cherry Water.—1. Distill 2¾ lb. crushed cherry stones with 3⅞ gal. water; add 2¼ to 2½ gal. cherries and distill off 1½ to 2¼ gal. cherry water.

2. Bruise and rub through a hair sieve enough ripe cherries to produce 1 pt. of juice; add to this 1 lb. sugar and 1 qt. water.

Cinnamon Water.—

Bruised cinnamon	1	lb.
Water	2	gal.

Simmer in a still for ½ hour, put what comes over back into a still again. When cold strain through flannel.

Eau Spiritueuse de Citron de Bergamote.—

Fresh lemon peels	1½	lb.
Brandy	9	lb.

Macerate for 4 days, distill over a water bath.

Eau de Cologne.—The following formulæ are all said to be the original:

1.	Oil of bergamot	150	min.
	Oil of lemon	60	min.
	Oil of Portugal	50	min.
	Oil of neroli	20	min.
	Oil of petit grain	10	min.
	Oil of lavender (Eng.)	20	min.
	Oil of rosemary	10	min.
	Oil of melissa	5	min.
	Finest spirit	30	oz.
	Rose water	14	drm.
	Orange flower water	14	drm.
2.	Oil of bergamot	100	min.
	Oil of lemon	50	min.
	Oil of Portugal	30	min.
	Oil of petit grain	10	min.
	Oil of lavender	20	min.
	Oil of rosemary	15	min.
	Finest spirit	30	oz.
	Rose water	9	drm.
	Orange flower water	9	drm.
	Distilled water	9	drm.

The above formulæ are for preparing the perfume by the cold method. The proper plan is to add the oils to the spirit in the order in which they are set down, shake well, and set aside for a few days, shaking occasionally before adding the waters. After these are added, again set aside for some time, and, if not perfectly clear, filter.

3.	Oil of Portugal	180	min.
	Oil of bergamot	180	min.
	Oil of cedrat	120	min.
	Oil of lemon	120	min.
	Oil of neroli	190	min.
	Oil of petit grain	120	min.
	Oil of rosemary	240	min.
	Oil of lemon	240	min.
	Finest spirit	10	oz.

This formula is for the preparation of a concentrated eau de Cologne, which will bear dilution with ten times its volume of fine spirit. Dissolve the oils in the 10 oz. of spirit, and set aside for fourteen days, shaking four times a day. Then distill the mixture twice, when the result will be 10 oz. of an exceedingly strong perfume, which improves in odor the longer it is kept, and is specially suited for exportation. It is of good odor when freshly diluted with spirit, but in this case also the odor improves on keeping.

4. Oil of bergamot	375	min.
Oil of cedrat	60	min.
Oil of lemon	60	min.
Oil of lavender	30	min.
Oil of Portugal	60	min.
Oil of thyme	4	min.
Oil of neroli	75	min.
Oil of rosemary	75	min.
Finest spirit (alcohol)	62	oz.

Mix and distill, then add to the distillate 2½ oz. of melissa water and 5 oz. orange flower water, and distill again. The product is a very fine eau de Cologne, the formula dating as far back as 1821, but the following goes even farther, viz., to 1813:

5. Oil of neroli	10	min.
Oil of lemon	40	min.
Oil of bergamot	50	min.
Oil of cedrat	15	min.
Oil of lavender	18	min.
Oil of rosemary	10	min.
Melissa water	4½	oz.
Finest spirit (alcohol)	30	oz.

Dissolve the oils in a spirit contained in a retort, giving the mixture a thorough shaking, then close the retort and keep the contents just warm for forty-eight hours, whereby perfect blending of the oils with the spirit is insured. Then place it for twenty-four hours in a cool place, after which filter it through paper until it is obtained perfectly clear. With the filtrate mix the melissa water.—*Chemist and Druggist.*

6. The following gives an article of superior quality, if the oils are pure and the alcohol good:

Pure alcohol	6	gal.
Oil of neroli	4	oz.
Oil of rosemary	2	oz.
Oil of orange	5	oz.
Oil of citron	5	oz.
Oil of bergamot	2	oz.

Mix with agitation; then allow it to stand for a few days perfectly quiet before bottling.

The following affords a good article, but not equal to the preceding.—

Pure alcohol	6	gal.
Oil of neroli	2½	oz.
Oil of rosemary	2	oz.
Oil of orange peel	4	oz.
Oil of lemon	4	oz.
Oil of bergamot	4	oz.

7. A Good Cheap Cologne.—The *Druggists' Circular* gives this recipe.—

Oil of bergamot	1	fl. drm.
Oil of orange	1	fl. drm.
Oil of rosemary	1	fl. drm.
Orange flower water	1	pt.
Alcohol	1	pt.
Cardamom seeds	1	drm.

Mix, digest, and distill over 1 pt.

8. Farina.—

Angelica root	10	grn.
Camphor	15	grn.
Cassia lignea	20	grn.
Cloves	20	grn.
Mace	20	grn.
Nutmegs	20	grn.
Wormwood (tops)	20	grn.

	Troy.	
Calamus aromaticus	½	drm.
Sage	½	drm.
Thyme	½	drm.
Orange flowers	1	drm.
Lavender flowers	1½	drm.
Rose petals	3	drm.
Violets	3	drm.
Balm mint	1	oz.
Spearmint	1	oz.
Lemons (sliced)	2	
Oranges (sliced)	2	
Rectified alcohol	5	gal.

Bruise or slice the solids, and digest them in the spirit, with frequent agitation, for two or three days, then distill off two-thirds. To the distillate add of—

Oil of bergamot	1	fl. oz.
Oil of jasmine (essential)	1	fl. oz.
Oil of balm mint	1	fl. drm.
Oil of cedrat	1	fl. drm.
Oil of lavender	1	fl. drm.
Oil of lemon	1	fl. drm.
Neroli (pure)	20	drops.
Essence (oil) of anthosseed	20	drops.

Agitate until solution is complete, and the next day, if necessary, filter. Very complicated, and the formula is not recommended.

9. Gassincourt.—		
Neroli	24	drops.
Oil of bergamot	24	drops.
Oil of cedrat	24	drops.
Oil of lemon	24	drops.
Oil of orange	24	drops.
Oil of rosemary	24	drops.
Lesser cardamom seeds (bruised)	¼	oz.
Alcohol at 32° Baumé (say, 38 o.p.)	1	qt.

Digest a few days, and then distill 1½ pt.

	Troy.	
10. *Paris Codex.*—		
Oil of cinnamon	¾	oz.
Oil of lavender	1½	oz.
Oil of rosemary	1½	oz.
Neroli	1½	oz.
Oil of bergamot	3	oz.
Oil of cedrat	3	oz.
Oil of lemon	3	oz.
Spirit of rosemary	1	qt.
Compound spirit of balm	3	pt.
Rectified alcohol	3	gal.

Digest eight days, and then distill 3 gal. This is the officinal eau de cologne of the French Ph.

11. Farina Cologne.—		
Oil lemon	2½	oz.
Oil bergamot	2¼	oz.
Oil lavender, fine	½	oz.
Oil neroli	2	drm.
Extract orange flower	4	oz.
Extract musk, best	4	oz.
Extract civet	½	oz.
Alcohol	2	gal.
Water	3	pt.
Extract benzoin	1	oz.
12. Fragrant Cologne.—		
Oil bergamot	3	oz.
Oil lemon	1	oz.
Oil lavender, fine	¼	oz.
Oil cloves	¼	oz.
Oil sandal wood	½	oz.
Alcohol	2	gal.
Water	3	pt.

13. Golden Farina Cologne.—There are thousands of cologne formulas, but the following is said by the *Druggists' Circular* to be superior to most of them:

Tincture of Canada snakeroot	4	oz.
Tincture of orris root	12	oz.
Oil of bergamot	6	drm.
Oil of lavender	6	drm.
Oil of lemon	6	drm.
Essence of musk	1	drm.
Oil of neroli	1	drm.
Oil of cinnamon	1	drm.
Oil of cloves	1	drm.
Orange flower water	8	oz.
Cologne spirits, sufficient to complete	6	pt.

Cosmetic Water, Viennese.—This very economical and fragrant cosmetic is prepared as follows:

Bruised almonds	15	parts.
Water of orange flower	62	parts.
Water of roses	62	parts.

Rub up the almonds with the waters, allow to stand, express, and add

Borate of soda	1	part.
Spirit of benzoin	2	parts.

Dissolve.

Creole Water.—Orris root, 6¾ oz., cut in small pieces, put in 1½ pt. French brandy. Allow it to stand for 2 weeks, stir frequently, filter. Then add 3 pt. French brandy, 3 drm. oil of orange blossoms, ¾ fl. oz. oil geranium. Distill and add a little cumarin essence.

Currant Water.—1. To 1 pt. of red currant juice and 1 gill of raspberry juice add 1 lb. of fine white sugar and 1 qt. of water.

2. One lb. of fine red currants, ½ lb. of raspberries, 1 lb. of crushed loaf sugar, water.

Pick the fruit, add ½ pt. of water, and crush with a wooden spoon, then put the pulp into a preserving pan with half the sugar. Stir till it is beginning to simmer, then filter through a hair sieve. Make the rest of the sugar into a syrup with 3 gills of water, pour it to the fruit syrup, add 1½ pt. of water. Let it cool, then decant like wine for use. Make in July or August.

Eaux, in perfumery, are either solutions of the fragrant essential oils, in spirit, with or without the addition of other fragrant substances; or they are distilled waters largely charged with the odorous principles of flowers. *Eau de Cologne, eau de lavande, eau de bouquet*, etc., are examples of the first; and *eau de rose, eau de fleurs d'oranges*, etc., of the second. The application of the term is usually restricted to articles of the kind imported from the South of France or Italy, and always so in reference to those of the latter class. English perfumers often give the name to perfumed spirits of their own manufacture, which, though generally greatly inferior to those imported, they pass off as foreign, or as made by foreign houses here.

The *eaux* of the first class just referred to, resemble, for the most part, the other esprits or perfumed spirits. They differ from *extraits* and most of the essences in being colorless, or nearly so; a quality which is secured either by distillation, or by the use of only pure and pale essential oils and essences in their preparation. They also generally, but not always, possess less alcoholic strength, and are less highly charged with odorous matter than those preparations.

Eger Water.—

Carbonate of soda	5	grn.
Sulphate of soda	4	scr.
Chloride of sodium	10	grn.
Sulphate of magnesia	3	grn.
Chloride of calcium	5	grn.
Carbonated water	1	pt.

Or it may be made without apparatus, thus:

Bicarbonate of soda	30	grn.
Chloride of sodium	8	grn.
Sulphate of magnesia	3	grn.
Water	1	pt.

Dissolve, and add a scruple of dry bisulphate of soda and close the bottle immediately.

Eau d'Elegance.—

Spirit of jessamine	1	pt.
Rectified spirit	½	pt.
Spirits of hyacinth	½	pt.
Spirits of storax	½	pt.
Tincture of star anise	2	fl. oz.
Tincture of tolu	2	fl. oz.
Tincture of vanilla	1	fl. oz.
Essence of ambergris	½	drm.

Mix, and in a week decant the clear portion.

Ems.—

1. Carbonate of soda	2	scr.
Sulphate of potash	1	grn.
Sulphate of magnesia	5	grn.
Sodium chloride	10	grn.
Calcium chloride	3	grn.
Carbonated water	1	pt.
2. Sodium carbonate	2	scr.
Potassium sulphate	1	grn.
Sulphate of magnesia	5	grn.
Sodium chloride	10	grn.
Calcium chloride	3	grn.
Carbonated water	20	oz.

Florida Water.—

1. Oil bergamot	2	oz.
Oil lavender, fine	1	oz.
Oil cloves	¼	oz.
Extract civet	1	oz.
Oil pimento	¼	oz.
Alcohol	2	gal.
Water	4	pt.
2. Oil of lavender	4	oz.
Oil of bergamot	4	oz.
Oil of cinnamon	2	drm.
Oil of cloves	1	drm.
Oil of neroli	2	drm.
Pure musk	4	grn.
Cologne spirits, 95%	1	gal.

Macerate fifteen days and filter through paper.

Anosmin Foot Water (Koch). Aqueous solution of tartaric acid. Used to cure bad odor of the feet.

Geranium Water.—Three fl. oz.—

Tincture of orris	6	fl. oz.
Tincture of ambrette	6	fl. oz.
Alcohol 95°	4½	pt.
Rose water	¾	pt.

Goulard Water, Goulard's Lotion. — This is ordered to be prepared by adding 2 fl. drm. solution of diacetate of lead and 2 fl. drm. rectified spirit to 19½ fl. oz. distilled water. It is kept ready prepared in the shops. It is white and poisonous. Used as a sedative, refrigerant and astringent lotion, in various affections; also in many cosmetic washes.

Harrogate Water. — Chloride of sodium, 100 gr.; chloride of calcium, 10 gr; chloride of magnesium, 6 gr.; bicarbonate of soda, 2 gr.; water, 18½ oz. Dissolve and add simple sulphureted water, 1½ oz.

Eau Spiritueuse d'Heliotrope.—Take vanilla, 3 drm.; double orange flower water, 6 oz.; alcohol, 33 B., 1 qt. Macerate for three days and distill over a water bath. Color the liquid with tincture of cochineal.

Eau d'Hongrie, Hungary Water, Compound Spirit of Rosemary.—

1. Rosemary tops (in blossom)	2	lb.
Sage (fresh)	¼	lb.
Rectified spirit	3	qt.
Water	1	qt.

Digest for ten days, throw the whole into a still, add of common salt, 1½ lb., and draw over 6 pt.

To the distillate add of—

Jamaica ginger (bruised)	1	oz.

Digest a few days, and either decant or filter. The old plan of adding the ginger before distillation is wrong, as the aromatic principle of the root does not pass over with the vapor of alcohol.

2. Oil of rosemary (pure)	1½ to 2	fl. drm
Oil of lavender (English)	½ to 2	fl. drm
Orange flower water	½	pt.
Rectified alcohol	1½	pt.

Mix. The first is the genuine formula. The second is that of the English perfumers. Spirit of rosemary is now commonly sold for it by the druggists.

Eau de Rosieres.

Esprit de jasmin	1	fl. oz.
Esprit de fleurs d'oranges	1	fl. oz.
Spirit of angelica root	2	fl. oz.
Spirit of celery seed	2	fl. oz.
Spirit of cucumber	2	fl. oz.
Esprit de rose	4	fl. oz.
Tincture of benzoin	3	fl. drm

Mix. A very agreeable perfume; also used as a cosmetic.

Hunyadi Janos.—H. Fresenius analyzed the Hunyadi Janos water and found it to contain the following salts:

Sodium sulphate	19·662123
Magnesium sulphate	18·449451
Calcium sulphate	1·321953
Potassium sulphate	0·132943
Sodium chloride	1·424068
Magnesium carbonate	0·731347
Iron carbonate	0·002059
Silica	0·011218
Carbonic acid (semi-combined)	0·383868
Carbonate acid, free	0·01 683
Lithium	Traces.
Strontium	Traces.
Nitric acid	Traces.
Boracic acid	Traces.
Bromine and iodine	Traces.
Nitrogen	Traces.
Phosphoric acid	Traces.

The carbonates are calculated as simple monocarbonates, and all the salts are anhydrous, *i. e.*, without water of crystallization. The cathartic properties are due to the salts of magnesia and sulphate of soda.

Iron Water.—Put ¾ lb. of new iron nails in a large glass bottle with ½ pt. of water; let them remain thus for 8 days, and pour in 1 qt. more water. Replenish the bottle with water as it is used. Iron water is taken at meals with a little claret added, and is recommended for delicate children.

Javelle Water.—1. Javelle water proper is prepared by passing gaseous chlorine—derived from the action of hot sulphuric acid on a mixture of common salt and oxide of manganese—into a 10% aqueous solution of carbonate of potash until the latter will absorb no more. It may also be made by adding a solution of carbonate of potash to a solution of chlorinated lime (bleaching powder) as long as a precipitate continues to form, the liquid being afterward decanted or filtered. Ordinarily, however, the liquid called javelle water is chlorinated soda, and not potassa.

2. This liquid, also known as Labarraque's disinfectant, is prepared by dissolving 12 oz. (avoir.) of soda crystals in 1 qt. (imperial), and saturate with chlorine gas evolved from 1 oz. of black oxide of manganese, 4 oz. common salt, and 2½ fl. oz. of sulphuric acid diluted with 3 fl. oz. of water by aid of heat in a retort.

3. A readier way of making the solution for ordinary purposes consists in making a solution of ½ lb. good lime chloride in 3 pt. of water with 7 oz. carbonate of soda (crystals) in 1 pt. of water—drawing off the clear liquid after the mixture has settled.

4. Glauber salt (sulphate of soda) may be used instead of part of the carbonate; with this the proportion may be 5 lb. bleaching powder, 10 lb. sulphate of soda, 4 lb. sal soda and 4 pails of water, well mixed. Sulphate of lime deposits from this liquid.

5. Javelle water, used for turning white the dirtiest linen and removing stains, is composed of bicarbonate of soda, 4 lb.; chloride of lime, 1 lb. Put the soda into a kettle over the fire, add 1 gal. of boilling water, let it boil from ten to fifteen minutes, then stir in the chloride of lime, avoiding lumps. Use when cool. This is good for removing fruit stains from white underwear.

Jasmine Water.—Take 12 oz. of white jasmine flowers; essence of bergamot, 8 drops; spirits of wine, 1 gal.; water, 2 qt. Digest for two days, in a close vessel; then draw off by distillation 1 gal., and sweeten with loaf sugar.

Lavender Water, Eau de Lavande.—

1. Flowering tops of lavender (fresh, and carefully picked)	10	lb.
Rectified spirit	1	gal.
Water	½	gal.

Digest a week, throw it into a clean still, add 1½ lb. of common salt dissolved in ½ gal. of water, and after stirring the whole together, draw over, rapidly, 1 gal., by the heat of steam, or of a salt water bath. To the distillate add—

Oil of bergamot	5	fl.drm.
Essence of ambergris (finest)	2	fl.drm.

and mix well. Very fine.

2. Oil of lavender (finest; Mitcham)	2	oz.
Essence of musk (finest)	1	fl. oz.
Essence of ambergris (finest)	½	oz.
Oil of bergamot (recent; pure)	½	oz.
Rectified alcohol (56 over proof, scentless)	½	gal.

Mix by agitation. Very fine without distillation; but better for it, in which case, the essences should be added to the distillate. Delightfully and powerfully fragrant.

3. Smith's British Lavender.—

Oil of lavender (Mitcham)	½	oz.
Essence of ambergris	¼	oz
Eau de cologne (finest)	¼	pt
Rectified alcohol	½	pt.

Mix by agitation. Very fragrant, and much esteemed.

Eau de lavande is a most agreeable and fashionable perfume for personal use; but like most others of its class, it must not be used too freely. Its excessive use distinguishes the vulgar.

4. Eau de Lavande de Millefleurs.—

Eau de lavande	1	qt.
Oil of cloves	1½	fl.drm.
Oil of cassia	½	fl.drm.
Essence of ambergris	½	fl.drm.

Mix.

5. Oil of lavender (flowers)	3	drm.
Oil of bergamot	3	drm.
Oil of roses (otto)	6	drops.
Oil of cloves	6	drops.
Musk	2	gr.
Oil of rosemary (best)	1	drm.
Honey	1	oz.
Benzoic acid	40	gr.
Rectified spirit	20	oz.
Water	3	oz.

6. Ammoniacal Lavender Water.—Oil of lavender (English), 1½ fl. oz.; spirit of ammonia (caustic); 2¼ pts. Mix. Used as a stimulating scent for headaches, fainting, etc. This is the French preparation.

7. Lavender Water.—

Oil of lavender	12	grm.
Oil of bergamot	12	grm.
Oil of rose (otto)	6	drops.
Oil of cloves	6	drops.
Oil of rosemary	3	grm.
Tincture of musk	3	grm.
Benzoic acid	2	grm.
Honey	15	grm.
Alcohol, 90%	500	grm.
Rose water	50	grm.

Thoroughly mix and filter.—*Pharm. Era.*

Lemon Water.—(French Eau de Citron.) Rinds of 8 lemons, water, 4 l.; salt, 25 grm. Distill off ½ the water.

Lime Water Carbonated.—Carrara Water.—Lime water (prepared from lime made by calcining Carrara marble) is supersaturated by strong pressure with carbonic acid, so that the carbonate of lime at first thrown down is redissolved. It contains 8 grm. of carbonate of lime in 10 fl. oz. of water.

Lisbon Water.—

Rectified spirit (not less than 60 over proof)	1	gal.
Otto of orange peel	4	oz.
Otto of citron zeste	2	oz.
Otto of rose	¼	oz.

Lithia Water, Aerated.—This may be conveniently made from the fresh precipitated carbonate, dissolved in carbonated water, as directed for fluid magnesia. Its antacid and antilithic properties promise to be useful.

Eau de Luce.—

Tincture of benzoin, or balsam of Peru	1	oz.
Otto of lavender	10	drops.
Oil of amber	5	drops.
Liquor ammonia	2	oz.

If requisite, strain through cotton wool; it must not be filtered, as it should have the appearance of a milk white emulsion.

Marienbad.—

Carbonate of soda	2	scr.
Sulphate of soda	96	grn.
Sulphate of magnesia	8	grn.
Chloride of sodium	15	grn.
Chloride of calcium	10	grn.
Carbonated water	1	pt.
Or—		
Bicarbonate of soda	50	grn.
Sulphate of soda	1	drm.
Chloride of sodium	15	grn.
Sulphate of magnesia	10	grn.

Dissolve in 1 pint of water, add 25 grn. of dry bisulphate of soda, and cork immediately.

Marienbad Purging Salts.—

Bicarbonate of soda	5	oz.
Dried sulphate of soda	12	oz.
Dry chloride of sodium	1½	oz.
Sulphate of magnesia, dried	2	oz.
Dried bisulphate of soda	2½	oz.

Mix the salts, previously dried, separately, and keep them carefully from the air.

Eau de Miel, Honey Water.—

1. Esprit de rose, No. 3	1	pt.
Esprit de jasmin, No. 2	½	pt.
Eau de fleurs d'oranges	½	pt.
Rectified spirit	½	pt.
Essence of vanilla	1	fl. oz.
Essence of musk	6	fl.drm.
Essence of ambergris	3	fl.drm.
Essence of Portugal (oil)	2	fl.drm.
Oil of rosemary	1	fl.drm.
Oil thyme	1	fl.drm.
Flowers of benzoin	½	drm.

Mix, and agitate them well together for some minutes. Delightfully fragrant.

2. Oil of bergamot	1	fl.drm.
Oil of lemon	½	fl.drm.
Oil of cloves	10	drops.
Oil of lavender	8 or 10	drops.
Oil of rosemary	8 or 10	drops.
Musk (finest, powdered)	4	grn.
Ambergris (finest, powdered)	3	grn.
Eau de fleurs d'oranges	½	pt.
Eau de rose	½	pt.
Rectified alcohol	1	qt.

Digest, with agitation, twelve or fourteeen days, and then decant or filter. Very fragrant.

Mont d'Or Water.—

Bicarbonate of soda	70	gr.
Sulphate of iron	¾	gr.
Chloride of sodium	12	gr.
Sulphate of soda	½	gr.
Chloride of calcium	4	gr.
Chloride of magnesium	2	gr.
Aerated water	1	pt.

Naples Water.—

Crystallized carbonate of soda	15	gr.
Fluid magnesia	1	oz.
Simple sulphureted water	2	oz.
Aerated water	16	oz.

Introduce the sulphureted water into the bottle last.

Eau de Naples.—Neapolitan washing solution.—

Borax	12	parts.
Distilled water	100	parts.
Rose water	50	parts.
Camphor	1	part.
Tincture of benzoin	4	parts.

Orange Flower Water.—

Oil of neroli	8	drops.
Rectified alcohol	2	drm.
Magnesia	½	drm.

Rub the whole together in a mortar, gradually adding a pint of distilled or rain water. Finally, filter the liquid through white blotting paper, and it is ready for use.

Paradise Water.—Distill—

Ninety per cent. alcohol Tr.	2⅜	gal.
Cardamoms	½	oz.
Anise seed	1⅜	oz.
Rosewood	1	oz.
Calamus	1⅜	oz.
Orris root	1	oz.
Angelica root	1⅝	oz.
Fresh lemon peel	1⅛	lb.

To this add 13¼ lb. sugar syrup and 1½ gal. water. Color green. Add a little silver leaf rubbed fine.

Eau de Paris.—

Eighty-five per cent alcohol	2,000	parts.
Portugal oil	15½	parts.
Oil of lemon	15½	parts.
Oil of bergamot	15½	parts.
Neroli	3½	parts.
Oil of rosemary	2	parts.

Passy Water.—

Sulphate of iron	2	gr.
Chloride of sodium	3	gr.
Carbonate of soda	4	gr.
Chloride of magnesium	2	gr.
Aerated water	1	pt.

Peach Water.—

Eighty degree alcohol	3	pt.
Tincture of tolu	3	oz.
Oil of almonds (essential)	1½	drm.
Extract of jasmine	6	oz.
Extract orange flower	6	oz.

Pleasant toilet water.

Perfumed Waters, Directions for Distilling.—The still should have a high and narrow neck, to prevent the liquor in it from spurting over, and should be furnished with a steam jacket, or a bath should be used to prevent injury from excessive heat. Dry, hard, or fibrous substances should be bruised, or otherwise mechanically divided and macerated in water before undergoing distillation. In almost all cases, salted or pickled flowers, herbs, etc., are superior to fresh ones. The product from them has little or none of the herbaceous and raw odor which is always present when fresh ones are used; besides which the waters thus prepared keep better, and reach maturity, or the full developement of their odor in a much shorter time. Ebullition should be attained as quickly as possible, and should be continuous, and the heat, when possible, be regulated by a thermometer.

Waters distilled from plants are apt to have a smoky odor at first, even when the greatest care and precaution have been observed in their distillation; exposure for a short time to the air will remove this, after which they should be kept in closely stoppered bottles, and preferably in bottles containing only sufficient for probable use at one time; they should be entirely filled and closed air-tight.

Pineapple Water.—One large foreign pineapple, 1 pt. of boiling syrup, juice of 1 lemon.

Peel the pine, slice and mash it well in a basin, then pour on the syrup and lemon juice; stir well and cover. Let it stand two hours, then filter through a fine silk sieve and add 1 qt. of spring water. Time, two and a quarter hours. Make this in October.

Eau de Portugal.—

Alcohol, (60 over proof)	1	gal.
Essential oil of orange peel	8	oz.
Essential oil of citron zeste	2	oz.
Essential oil of bergamot	1	oz.
Essential oil of otto of rose	¼	oz.

Pullna Water.—

Sulphate of soda	4	drm.
Sulphate of magnesia	4	drm.
Chloride of calcium	15	grn.
Chloride of magnesium (dry)	1	scr.
Chloride of sodium	1	scr.
Bicarbonate of soda	10	grn.
Water, slightly carbonated	1	pt.

One of the most active of the purgative saline waters.

Pullna Water without the Machine.—

Bicarbonate of soda	50	grn.
Sulphate of magnesia	4	drm.
Sulphate of soda	3	drm.
Chloride of sodium	1	scr.

Dissolve in 1 pint of water; add, lastly, 2 scr. of bisulphate of soda, and close the bottle immediately.

Salts for Making Pullna Water.—

Dry carbonate of soda	1	oz.
Exsiccated sulphate of magnesia	1½	oz.
Dry chloride of sodium	2	drm.
Dry tartaric acid	¾	oz.
Or rather dry bisulphate of soda	1	oz.

Pyrmont Water.—

Sulphate of magnesia	20	grn.
Chloride of magnesium	4	grn.
Chloride of sodium	2	grn.
Bicarbonate of soda	16	grn.
Sulphate of iron	2	grn.
Carrara water	1	pt.

Eau de Quinine.—A favorite hair wash that is much used in Berlin and Liepzig contains 2 grm. balsam of Peru, 6 grm. castor oil, 60 grm. rum, 35 grm. water, 5 grm. tincture of red chinchona. Its constituents are at least harmless, which can be said of but few of our American preparations for the hair.

Raspberry Water.—To 1 pt. of raspberry juice add 1 gill of red currant juice, 1 lb. of sugar, and 1 qt. of water.

Rice Water.—Take of—

Rice	2	oz.

Let it be well washed, and add to it—

Water	2	qt.

Boil it for an hour and a half, and then add sugar and nutmeg as much as may be required. To be taken *ad libitum*.

Rice, when boiled for a considerable time, assumes a gelatinous form, and, mixed with milk, is a very excellent diet for children. It possesses, in some measure, a constipating property which may be increased by boiling the milk.

Eau Romaine.—

Jasmine water	3	qt.
Vanilla water	1	qt.
Acacia water	1	qt.
Tuberose water	1	pt.
Essence of amber	2	oz.
Tincture of benzoin	8	oz.
2. Essence of ambergris	1	fl.drm.
Tincture of benzoin	4	fl.drm.
Spirit of tuberose	1½	fl. oz.
Tincture of vanilla	2	fl. oz.
Esprit de fleurs d'acacia	2½	fl. oz.
Esprit de jasmin	7½	fl. oz.
Essence de petit grain	8 or 10	drops.

Mix.

The last essence is often omitted, and the tincture of benzoin reduced in quantity.

3. Essence of ambergris	1	fl. oz.
Tincture of benzoin	4	fl. oz.
Spirit of tuberose	½	pt.
Spirit of acacia flowers	1	pt.
Tincture of vanilla	1	pt.
Spirit of jasmin	3	pt.

Sea Water.—

Chloride of sodium	4	oz.
Sulphate of soda	2	oz.
Chloride of calcium	¼	oz.
Chloride of magnesium	1	oz.
Iodide of potassium	4	grn.
Bromide of potassium	2	grn.
Water	1	gal.

A common substitute for sea water as a bath is made by dissolving 4 or 5 oz. of common salt in 1 gal. of water.

The following mixture of dry salts may be kept for the immediate production of a good imitation of sea water:

Chloride of sodium (that obtained from evaporating sea water, and not recrystallized, in preference)	85	oz.
Effloresced sulphate of soda	15	oz.
Dry chloride of calcium	4	oz.
Dry chloride of magnesium	16	oz.
Iodide of potassium	2	drm.
Bromide of potassium	1	grn.

Mix, and keep dry. Put 4 or 5 oz. to 1 gal. of water.

Eau Sedative.—Dorvault gives the following:

Ammonium hydroxide	60	parts.
Tincture of camphor	10	parts.
Sodium chloride	60	parts.
Water	1000	parts.

Mix.

Seidlitz Water.—This is usually imitated by strongly aerating a solution of 3 drm. sulphate of magnesia in 1½ pt. of water. It is sometimes made 6, 9 and 12 drm. of the salts to 1½ pt. of water, according to the strength desired.

Seidlitz Powder.—The common seidlitz powders do not resemble the water. A closer imitation would be made by using effloresced sulphate of magnesia instead of the potassio-tartrate of soda. A still more exact compound will be the following:

Effloresced sulphate of magnesia	2	oz.
Bicarbonate of soda	½	oz.
Dry bisulphate of soda	½	oz.

Mix, and keep in a close bottle.

Seidschutz Water.—

Sulphate of magnesia	3	dr.
Chloride of calcium	8	grn.
Nitrate of lime	8	grn.
Bicarbonate of soda	8	grn.
Sulphate of potash	5	grn.
Aerated water	1	pt.

Seltzer Water.—This is a natural mineral water; but if an imitation of it be required the following is its analysis, according to Bergman:

1. Water	16	fl. oz.
Carbonic anhydride	17	cub.in.
Carbonate of sodium	4	grn.
Carbonate of magnesium	5	grn.
Carbonate of calcium	3	grn.
Chloride of sodium	17	grn.

Of course a proper machine will be required for forcing the gas into it, unless it be made on a small scale in a gazogene.

2. Fused chloride of calcium	4	grn.
Chloride of magnesium	12	grn.
Chloride of sodium	15	grn.
Citrate of iron	½	grn.
Tartaric acid	2	drm.
Bicarbonate of soda	2½	drm.
Water	q. s.	

Dissolve all the salts, excepting the tartaric acid and the bicarbonate, in about 1 pt. of water, and introduce the solution into a champagne bottle. Then, having completed the requisite quantity of liquid so as to leave an empty space of about 2 fl. oz., add the tartaric acid, and, immediately after, the bicarbonate of soda. Cork the bottle tightly, secure the cork with stout cord, and set the bottle aside for about six hours before it is opened. It is then ready for use.

Soda Water.—The ordinary soda water sold in bottles consists simply of carbonic acid water flavored in the usual way; thus for lemon the recipe is:

Syrup	1	gal.
Citric acid	2½	drm.
Oil of lemon	1	drm.

Triturate the acid and oil together until thoroughly mixed, then add the syrup gradually.

Water, To Soften Hard.—Two parts bicarbonate of soda, 4 parts calcined soda, 4 parts of a solution of silicate of soda. The mixture should stand for twenty-four hours, when it generally becomes hard, so that it can be rubbed to a powder; 2 to 3 lb. of the mixture will generally soften 50 gal. of hot water.

Strawberry Water.—

Strawberries	1	lb.
Loaf sugar	½	lb.
Juice of 1 lemon.		

Crush the sugar finely, and sift over the strawberries, which should be red and ripe. Add ½ pt. of cold spring water, filter through a sieve, add 1 quart of spring water, and the strained juice of 1 lemon. Time required, half an hour. Make this in June or July.

Sulphureted Waters.—Pass sulphureted hydrogen into cold water (previously deprived of air by boiling, and cooled in a closed vessel) till it ceases to be absorbed.

Tar Water.—Put in a glass or china jar: Quarter pound of Stockholm tar, 3 pt. of water. Let the tar infuse for twenty-four hours, stirring it occasionally, and pour off this first water; then pour 3 pt. of fresh water on to the tar, and let it infuse for twelve hours. The jar should be replenished with water as it is used, renewing the tar every month only. Tar water may be drank alone or mixed with claret; it is considered a good blood purifier.

Tar Water, Infusion of Tar, Tar Tea.—

Wood tar	1	qt.
Cold soft water	1	gal.

Mix, and stir them briskly with a stick for at least fifteen minutes. After subsidence, pour off the water, strain it, and keep it in well stoppered bottles or jars. Used as a lotion in various chronic skin diseases, particularly of the scalp in children; also in failing hair, baldness, etc. It was once in high repute as a medicine for internal use.

Vanilla Water.—

Vanilla (in coarse powder)	1	lb.
Salt	5	lb.
Water	2½	gal.

Macerate for twenty-four hours, and then distill over (rapidly) 1 gal.

Vichy Salts.—

Bicarbonate of soda	2¼	oz.
Muriate of soda	22½	grn.
Effloresced sulphate of soda	1½	drm.
Effloresced sulphate of magnesia	1½	scr.
Dry tartarized sulphate of iron	1½	grn.
Dry tartaric acid or dry bisulphate of soda	1½	oz.

Mix the powders, previously dried, and keep in a well corked bottle.

Vichy Water.—For 10 gal. (80 lb.) of water use:

Sodium carbonate	4249	grn.
Sodium chloride	112	grn.
Potassium chloride	141	grn.
Sodium bromide	10	grn.
Sodium silicate	15½	grn.
Lithium carbonate	11	grn.
Calcium chloride	736	grn.
Magnesium chloride	308	grn.
Barium chloride	6¼	grn.
Aluminum chloride	12½	grn.
Iron chloride	⅛	grn.
2. Bicarbonate of soda	1	drm.
Chloride of sodium	2	grn.
Sulphate of soda	8	grn.
Sulphate of magnesia	3	grn.
Tincture of chloride of iron	2	drops.
Aerated water	1	pt.
3. Dorvault's.—		
Bicarbonate of soda	75	grn.
Chloride of sodium	4	grn.
Sulphate of iron	¼	grn.
Sulphate of soda	10	grn.
Sulphate of magnesia	3	grn.
Water	1	pt.

By adding 45 grn. (or less) of citric acid, an effervescing water is obtained.

4. M. Soubeiran, relying on the analysis of Longchamps, imitates vichy water by the following combination:

Bicarbonate of soda	125	grn.
Chloride of sodium	2½	grn.
Crystal chloride of calcium	12	grn.
Sulphate of soda	11½	grn.
Sulphate of magnesia	3¾	grn.
Tartrate of iron and potash	⅛	grn.
Water (1 liter)	2⅛	pt.
Carbonic acid (5 liters)	305	cub.in.

Dissolve the salts of soda and iron in part of the water, and add the sulphate of magnesia and then the chloride of calcium in the remaining water. Charge now with the carbonic acid gas under pressure.

Vichy Salts.—

Bicarbonate of soda	1½	oz.
Chloride of sodium	15	grn.
Effloresced sulphate of soda	1	drm.
Effloresced sulphate of magnesia	1	scr.
Dry tartarized potash and iron	1	grn.
Dry tartaric acid or dry bisulphate of soda	1	oz.

Mix the powders, previously dried, and keep them in a close bottle.

Violet Water.—

Violet pomade	6	lb.
Rectified spirit	1	gal.

Macerate and digest in closed vessel for a month and decant. Then add 3 oz. tincture orris root and 3 oz. cassia spirit to each pint.

West End Cologne.—

Oil bergamot	2	oz.
Oil lavender, fine	2	oz.
Oil cloves	½	oz.
Oil mace	½	oz.
Extract civet	1	oz.
Extract benzoin	1	oz.
Extract vanilla	1	oz.
Alcohol	2	gal.
Water	4	pt.

Wax Candles. See **Candles.**

Waxed Paper. See **Paper.**

Waxes.—Term applied to many bodies with some resemblance to the prototype of the group—beeswax. The principal waxes are as follows:

Beeswax.—Obtained from the cells of bees, and is largely adulterated.

Carnauba Wax.—Product of a palm tree of Brazil.

Chinese White Wax.—Joint product of an

insect and one or more trees, rarely seen in this country.

Cordillera Wax.—Product of the wax tree or varnish tree of the Cordilleras.

Fig Tree Wax.—Vegetable wax obtained from Java.

Indian White Wax.—This wax is produced from an insect; it is largely used for making candles in India.

Japan Wax.—Product of several trees of Japan.

Ozocerite, or Ozokerit.—This is an earth wax, and is of mineral origin, and bears a close relationship to petroleum and coal.

Palm Wax.—Product of a palm growing in the Cordilleras.

Bleaching of Wax.—When beeswax is exposed in thin layers to the air and to direct sunlight it is quickly rendered colorless, but in the dark, in presence of a free supply of air, oxygen, or ozone, no decolorization whatever is effected, even after a long time. In presence of sunlight, oxygen, and especially ozone, destroys the color very rapidly, but the presence of oxygen is not absolutely necessary. When the wax is exposed to sunlight *in vacuo*, or in an atmosphere of carbonic anhydride, it is bleached, but much more slowly than in the presence of air.

The composition of the unbleached wax differs considerably from that of wax which has been bleached by exposure to air and sunlight. The latter contains a slightly larger percentage of free acids, but a large proportion of the unsaturated acids of the oleic series and of the unsaturated hydrocarbons in the crude wax have disappeared. This fact shows that in the bleaching process not only does the coloring matter suffer total combustion, but the unsaturated acids and the unsaturated hydrocarbons are converted into saturated compounds by the fixation of oxygen. This is also the case with other fatty substances, such as suet, and the reason why the addition of 1 to 5 per cent. of suet to beeswax causes decolorization to proceed more quickly is because the suet, in its oxidation or combustion, aids the destruction of the coloring matters. The additon of a small quantity of other oxidizable substances, such as essence of terebenthene, also hastens the action, so that it would seem that the destruction of the coloring matter is due to the formation of ozone by the oxidation of the added substance.—*A. and P. Buisine.*

Beeswax.—To separate honey from wax, put honeycomb and all in a tin pan upon a moderately warm stove, adding a tablespoonful of water to each lb. of honey. Stir occasionally with a piece of wire until the contents of the pan are in a liquid condition. Do not allow boiling to begin. Remove the pan from the fire and set it aside to cool. The cake of wax, to which all impurities will adhere, may then be carefully lifted off with a knife.

Black Wax.— Melt 225 parts of best yellow wax and add 25 parts prepared silver litharge, and boil until the compound assumes a brown color, then add 8 parts of calcined lampblack, and pour into paper moulds.

Engravers' Border Wax.—

1. Beeswax	1	part.
Pitch	2	parts.
Tallow	1	part.

Bordering.—

2. Resin	3	oz.
Beeswax	2	oz.
Sweet oil		q. s.

Incorporate thoroughly by heat, turn in to cold water, and work thoroughly with the hands; if brittle melt again, and add more oil.

Bottle Wax.—1. Resin, pitch, ivory black, equal parts.

2. Resin	6½	parts.
Beeswax	½	part.
Venetian red or red lead	1½	parts.

3. Shellac	3	parts.
Venice turpentine	1¼	parts.
Vermilion	2¾	parts.

Or Venetian or red led, q. s.

4. Resin, 6 parts; shellac and Venice turpentine, each 2 parts; coloring matter to suit.

5. The following recipe is recommended by Scheirer:

Burgundy pitch	50	parts.
Turpentine	25	parts.
Colophony	100	parts.

Heat the pitch until all the water is driven off, then add the turpentine and colophony, and when the whole is liquid, add a mixture of the following in fine powder:

Chalk	50	parts.
Carbonate of magnesia	5	parts.
Armenian bole	50	parts.

Mix thoroughly.

6. The ingredients are shellac, 2 lb.; rosin, 4 lb.; Venice turpentine, 2½ lb.; red lead, 1½ lb. Melt the shellac and rosin cautiously in a bright copper pan, over a clear charcoal fire. When melted add the turpentine, and lastly, mix in the red lead. Pour into moulds, or form sticks on a warm marble plate. The gloss may be produced by polishing the sticks with a rag until they are cold.

7. Black Bottle Wax.—Common resin, 20 lb.; tallow, 5 lb.; lampblack, 4 lb. Mix with heat.

8. Red Bottle Wax.—Common resin, 15 lb.; tallow, 4 lb.; red lead, 5 lb.; mix and heat.

9. Resin, 6 oz.; shellac, 2 oz.; Venice turpentine, 2 oz.; melt and add lampblack, 9 oz. Pour into moulds.

10. Common resin, pitch and ivory black, equal parts.

11. Four oz shellac, 1 oz. Venetian turpentine, and 3 oz. vermilion. Melt the lac in a copper pan, suspended over a clear charcoal fire, then pour the turpentine slowly into it, and soon afterward add the vermilion, stirring briskly all the time of the mixture with a rod in either hand.

Wax, to Clean. See **Cleansing.**

Engraving Wax.—The following is said to be a good receipt for map engraving wax: Four oz. of linseed oil; ½ oz. of gum benzoin, and ½ oz. of white wax; boil ⅔.

Factitious Wax.—A spurious compound for veterinary purposes.

1. Yellow resin, 16 lb.; hard mutton suet or stearin, 8 lb.; palm oil, 2½ lb.; melted together.

2. As last, but substituting turmeric, 1 lb. for the palm oil.

3. Best annatto, 6 oz. or q. s.; water, 1 gal.; boil; add of hard mutton suet or stearin, 35 lb.; yellow resin, 70 lb.; again boil, with constant agitation, until perfectly mixed, and of a proper color, and as soon as it begins to thicken pour it out into basins to cool. When cold rub each cake over with a little potato starch.

Wax for Fish Lines, etc.—Use a mixture of beeswax and shoemakers' wax. In winter the quantity of the latter is in excess, while in summer more of the beeswax is used. These two ingredients are mixed together in a suitable vessel over a water bath.

Floors, Waxing Hard Wood.—1. Take 1 lb. of the best beeswax, cut it up into very small pieces, and let it thoroughly dissolve in 3 pt. of turpentine, stirring occasionally if necessary. The mixture should be only a trifle thicker than the clear turpentine. Apply it with a rag to the surface of the floor, which should be smooth and perfectly clean. This is the difficult part of the work, for if you put on either too much or too little, a good polish will be impossible. The right amount varies, less being required for hard, close grained wood, and more if the wood is soft and open grained. Even professional waxers are sometimes obliged to experiment, and novices should always try a square foot or two first.

Put on what you think will be enough, and leave the place untouched and unstepped on for twenty-four hours, or longer if needful. When it is thoroughly dry, rub it with a hard brush until it shines. If it polishes well, repeat the process over the entire floor. If it does not, remove the wax with fine sandpaper and try again, using more or less than before, as may be necessary, and continue your experimenting until you secure the desired result. If the mixture is slow in drying, add a little of the common driers sold by paint dealers, japan, for justance, in the proportion of 1 part of the drier to 6 parts of turpentine. When the floor is a large one, you may vary the tedious work of polishing by strapping a brush to each foot and skating over it.

2. Linseed oil, 100 parts; litharge, 10 parts; the best yellow wax, 75 parts; tallow, 7 parts; molasses, 90 parts; lampblack, 50 parts; oil of turpentine, 140 parts; alcohol, 17 parts; shellac, 2½ parts; aniline violet, 1 part. Boil the litharge for an hour with linseed oil, then add the melted wax and tallow and the molasses. Heat the whole to a temperature of 230° F. over a water bath until all the water has evaporated; then add the coloring matter.

Flowers, How to Make Wax.—This affords a pleasant way of passing time and is useful. Use only the purest virgin wax, entirely freed from all extraneous matters. Wax that is either granular or friable must be rejected. It is generally melted in vessels of tinned iron, copper, or earthenware. To render it ductile, fine Venice turpentine, white, pure, and of an agreeable odor, is added. The mixture is constantly stirred with a glass or wooden spatula. All contact with iron must be avoided, and if the vessels are of that material, they must be well and carefully tinned. When stiff leaves are to be executed, two parts of spermaceti are added to eight parts of wax, to give transparency. Much care and tact are needed in coloring the wax. The colors being in fine powder, are made into a paste by adding, little by little, essence of citron or lavender. When the trituration is perfect, this paste is mixed with melted wax, stirring rapidly all the while; and while the mass is still liquid, it is poured into moulds of pasteboard or tinned iron of the shape of tablets, and is then ready for use. Sometimes it is passed through fine muslin as it flows into the moulds.

Another method is to tie up the color in a muslin bag, and wave it about among the molten wax until the desired tint is obtained. To combine colors, it is only necessary to have 2 or 3 bags containing different colors, and to employ as much of each as shall have the desired effect. These bags, far from being spoiled by dipping in wax already containing other shades, have only to be rinsed in pure water to fit them for coloring other wax. The colors most in use in wax flower making are pure forms of white lead, vermilion, lake, and carmine, ultramarine, cobalt, indigo, and Prussian blue, chrome, Naples yellow, and yellow ocher. Greens and violets are chiefly made from mixtures of the above.

The wax being prepared, the manufacture of the artificial flowers is carried on in two ways. The first consists in steeping liquid wax in little wooden moulds rinsed with water, around which the wax forms in a thin layer, so as to take the form of the mould, and thus to present, when detached from it, the appearance of the whole or part of a flower. In this way lilac and other simple blossoms are obtained with much rapidity.

The branches are also executed with wax softened by heat, and moulded with the fingers round a thread of wire.

As for leaves and petals, they are cut out of sheets of colored wax of the proper thickness. These sheets are glossy on one side, and velvety on the other.

To express the veining of leaves, they are placed in moistened moulds, and pressed with the thumb sufficiently to get the impression, which is accurately copied from nature.

The petals are made to adhere simply by pressure; the leaves are placed on a little foot stalk, and the latter fastened to the stem.

The manner of procuring moulds for the accurate imitation of leaves is as follows: A natural leaf of the plant it is wished to imitate is spread out on a flat surface of marble, for example. It is lightly but equally greased with olive oil, and surrounded with a wall of wax, which must not touch it. Then in a small vessel containing a few spoonfuls of water a few pinches of plaster of Paris are to be thrown, and briskly stirred till the liquid has the consistence of thick cream. This is poured over the leaf, and left till it is well hardened. It is then lifted up and the leaf detached, when it will be seen that the plaster has taken a perfect impression of every vein and indentation. Such moulds are rendered far more durable if they are impregnated while warm with drying oil. This gives them greater solidity, and prevents their crumbling from frequent immersion in water.

It is necessary to impress strongly on all amateur wax flower makers the necessity for having all tools and moulds completely moistened with water, otherwise the wax will be constantly adhering, and preventing neatness of workmanship.

Gilding, Wax for.—

Oil	25	parts.
Yellow wax	25	parts.
Acetate of copper	13	parts.
Red ocher	37	parts.

The whole is melted, and stirred until cold.

Gilders' Wax, for Fire Gilding.—

1. White wax	24	parts.
Copper scale	6	parts.
Verdigris	3	parts.
Borax	½	part.
2. Armenian bole	12	parts.
White wax	48	parts.
Verdigris	6	parts.
Burnt ocher	2	parts.
Ferric sulphate	8	parts.
Borax	1	part.
3. White wax	48	parts.
Copper sulphate	12	parts.
Verdigris	12	parts.
Borax	1½	parts.
4. Red chalk	16	parts.
Yellow wax	36	parts.
Copper sulphate water	6	parts.
Verdigris	5	parts.
Borax	3	parts.
Burnt copper	6	parts.

Grafting Wax.—

1. Pitch	4	oz.
Resin	4	oz.
Lard	2	oz.
Beeswax	2	oz.

Melt over a slow fire, or

2. Melt together equal quantities resin and beeswax, and add enough tallow to produce the proper consistency.

Grafting Wax.—

3. Pine resin	50	parts.
Tallow	10	parts.
Turpentine	5	parts.
Alcohol, 90%	5	parts.

The resin is melted in an iron vessel. The turpentine is added, next the tallow, and finally the 90% Alcohol. Stir the ingredients thoroughly and cool.

4. A good grafting wax can be made by melting together 50 lb. resin, 10 lb. beeswax, and 1 gal. raw linseed oil. As soon as the resin and wax are melted, dip 1 pt. at a time into a bucket of cold water, keeping it away from the bucket with a stick. As soon as it is cool enough, stretch with slightly greased hands. If the wax

is to be used in very warm weather, a little less oil and beeswax will be better.

5. Liquid Grafting Wax.—This, if properly made, may be readily applied to outdoor grafting, without the trouble of heating, and it is also a good application to wounds made in pruning. The following directions are given by W. W. Tracy: Melt 1 lb. resin with 1 lb. tallow, and, when mixed, remove from the stove and allow it to cool till a scum begins to form. Then add a teaspoonful of turpentine. Replace on the stove, and add 7 oz. of a mixture of 2 parts alcohol and 1 part water, stirring briskly, and taking care that the alcohol does not burn, as it will if too hot. Stir till of the consistence of honey, keep corked, and apply with a brush. If it gets too hard, remelt, and apply a few drops of turpentine and alcohol and water. It hardens after applying.

Green Wax.—Melt 100 parts yellow wax, 100 parts white rosin, 33 parts ordinary turpentine, and then mix with 8 parts pulverized verdigris. Pour into paper moulds.

Impression Wax.—Temper parafin wax with olive oil to suit conditions. Mix a little whiting with it while hot.

Modeling Wax, to Make.—1. Melt 20 oz. best white wax, and while it is cooling mix with 1 oz. flake white.

2. Best yellow wax..... .....50 parts.
Venice turpentine..... .... 7 parts.
Lard .... 3¼ parts.
Bole elutriated.... . .....36 parts.
Mix, and knead thoroughly.

3. It is made of white wax, melted and mixed with lard to make it workable. In working it, the tools used, the board or stone, are moistened with water, to prevent its adhering; it may be colored to any desirable tint with a dry color.

4. Melt over a moderate fire 100 parts yellow wax, and add 13 parts Venetian turpentine, 6½ parts lard, 72½ parts elutriated bole. Mix thoroughly, pour the mixture gradually into a vessel containing water, and knead it several times with the hands. The wax must be melted at a temperature sufficiently low not to create bubbles. Add Indian red if desired for color.

Moulds, Wax, Preparation for Taking Moulds.—Whether the beeswax have stearine in it or not, it is best to prepare it in the following manner: Put some common virgin wax into an earthenware pot or pipkin, and place it over a slow fire; and when it is all melted, stir into it a little white lead (flake white), or black lead (plumbago), say about 1 oz. white lead to 1 lb. wax; this mixture tends to prevent the mould from cracking in the cooling, and from floating in the solution; the mixture should be remelted two or three times before using it for the first time. Resin has been recommended as a mixture with wax; mixtures of which, in various proportions, have been used with success; but when often used, decomposition or some change takes place, which makes the mixture granular and flexible, rendering it less useful for taking moulds. When resin is used, the mixture, when first melted, should be boiled, or nearly so, and kept at that heat until effervescence ceases; it is then to be poured out upon a flat plate to cool, after which it may be used as described.

Moulding Wax, Dentists.—Dr. P. David communicates to the *Journal de Pharmacie et de Chimie* an analysis of the composition known as Godiva or Stent. Upon this he bases the following formula:

Stearine.... .....25 parts.
Half soft copal..... .....25 parts.
Talc..... .....50 parts.
Carmine..... 0·5 parts.
Oil of rose geranium.....2 drops to 1 oz.

Melt the resin by the heat of a sand bath, and when slightly cooled add the stearine, stirring constantly. When this has melted add the other ingredients, previously intimately mixed, and stir so that a homogeneous product may be obtained.

The adhesiveness of the composition may be increased or diminished by modification of the amount of copal. A more thorough blending of the color may be insured by dissolving the carmine in a little potash solution before mixing with the chalk.

Palm Wax.—Obtained from trunk of Ceroxylon andicola. The crude wax does not melt below the temperature of boiling water.

Paraffine Wax.—Stearic Acid, to Color Black.—Melt the materials, and digest them for several minutes, with powdered anacardium nuts (Anacardium orientale). This nut contains a black fluid vegetable fat.

Polishing Wax.—Melt 2 parts best yellow wax and ½ part rosin, then add 1 part oil of turpentine.

Red Wax.—Ten parts best white wax, 6 parts of Venice turpentine; then add ½ part finely pulverized cinnabar to color. Pour into paper moulds.

Sealing Wax.—1. The chief ingredient of sealing wax is shellac, which is melted and mixed with an equal or lesser weight of Venetian turpentine; for the cheaper qualities, it is adulterated with ordinary resin; too much of the latter, however, makes it brittle. The color is given by powdered paints; for black, 1 lb. ivory black with 1 lb. resin and 2 lb. shellac; for red, 1 lb. vermilion, 1 lb. powdered chalk, 1 lb. resin, and 1 lb. shellac; for yellow, 1 lb. chrome yellow, 1 lb. Venetian turpentine, 1 lb. shellac; for white, 1 lb. white lead, 1 lb. pale resin, 1 lb. Venetian turpentine, 1 lb. shellac; for green, 1 lb. Prussian blue, 1 lb. orpiment, 1 lb. Venetian turpentine, 1 lb. shellac; for gold, 1 lb. silver foil, 2 lb. white resin, 2 lb. Venetian turpentine, 6 lb. shellac; the transparent yellow brown of the shellac gives the silver foil a gold color.

2. It is impossible to succeed in making this article when a good shellac is not used as a basis. In order to ascertain if it is fit for the purpose, try to melt a small quantity over a low coal fire; if it melts easily, thoroughly, and flows well, it is good; if not, reject it. In making sealing wax, mix first the paints, and let them be exceedingly well pulverized; let us, for instance, suppose that you wish to make the red sealing wax now in the trade under the name of express company sealing wax; take 2 lb. good vermilion and 7 lb. Paris white (which is very fine chalk), mix them thoroughly, then place 8 lb. shellac in a proper stoneware vessel, and heat it carefully over a moderate fire, stirring it with an iron spatula until it has become liquid; then warm 6 lb. of Venetian turpentine and add the same to the shellac; when well mixed, add gradually the mixture of chalk and vermilion, and stir continually till you have a homogeneous whole; it is better to use for this latter purpose a pestle. The fire must be only warm enough to keep the mass fluid. When well mixed, it is taken from the fire, when a warm, smooth stone must be ready to make the sticks; in order to do this you take with a spoon as much as is required for a stick, and roll it between the hands till it has about the shape, then place it on the warm stone and roll it with a board or metal plate; to give it a smooth surface it is, after solidification, superficially heated over a fire or proper lamp; this is the old way to make the sticks, without using forms; if you will go to the expense of procuring proper forms, you may press the sticks in them when in semi-solid condition, and give them any shape, square, flat, etc. Some experience, of course, is necessary to work with success at the right stage of heat.

Mixing.—It is essential that all the ingredients be dry, and to insure this they are kept in paper bags on a shelf running round the walls of the stove room at about 18 in. below the ceiling. The order of adding the ingredients is as follows: The resins and turpentine are first

melted together; then the neutral bodies (chalk, etc.), if any, are stirred in; next the pigments are added; and the volatile balsams and oils are only introduced at the last moment before forming. When only one pigment is used, it is simply warmed and stirred into the mass. When a shade is to be produced by a mixture of colors, no neutral bodies are added to the resins, but they are mixed with the colors in a china dish, warmed, and then added to the melted mass. Any required tint is obtained by mixing, and frequent testing.

Melting.—The melting of the mass should be conducted at the lowest possible temperature, sufficing only to keep it in a fluid state. Quantities of 20 lb. to 25 lb. are treated at a time in a vessel large enough to permit quick stirring. Often the furnace used resembles an ordinary cook stove, the fire heating cast iron plates; but these are objectionable from the inequality of the heating, and the risk of fire. Enameled cast iron pots are best for melting in, keeping a separate pot for each mixture. Before using a pot for a new color, it must be allowed to get quite cold, when the adhering wax can be easily cleaned off. The shellac is first put into the pot and melted, while being continually stirred with a flat paddle of hard wood; the turpentine is then intimately incorporated; next follow the neutral bodies and colors in a thin stream, with constant stirring, which is more necessary if the pigments are heavy. When the mass seems uniform, drops of it are examined by letting them fall on a cold, smooth, metallic plate, when the color, hardness, and fracture can be tested. When satisfactory, the heat is adjusted to maintain a fluid condition, aromatic substances are quickly stirred in, and forming is commenced.

Forming.—Sealing wax is moulded into sticks in special forms consisting of one piece for rectangular or triangular sticks, but must be of two for oval or round. Forms in one piece are made of rectangular brass plate, carrying grooves $\frac{1}{8}$ in. wider at top than at bottom, for facilitating removal of the sticks. It is a common practice to put forms on a stove, or cool them off while moulding by placing them on metallic trays with cold water beneath, to cool the sticks rapidly; this releases the forms more quickly, but makes the sticks brittle, and it is better to let them cool gradually on a wooden table, while if the form becomes so warm as to much protract the setting of the wax, it may be dipped in cold water and carefully dried before using again. Engraved forms are difficult to turn out, but this may be partly remedied by slightly rubbing the engraved parts with oil of turpentine. Surface ornamentation, such as gilding or silvering, is effected by placing the substance in the form. As brass forms are expensive, they are sometimes replaced by home-made ones of type metal. To produce them, a stick of fine wax is coated with a thin film of olive oil, and a cast of it is taken in plaster of Paris; when this is thoroughly dry, it is put into a small wooden box, and melted type metal is poured round to make a form. The forming of the wax is conducted as follows: The molten wax is ladled from the pot into a casting spoon, previously heated. By this it is poured in a uniform stream into the forms. These should be slightly warmed before the first moulding takes place.

Polishing.—Polishing, dressing, or enameling is usually applied to all grades, though the finer qualities have a lustrous surface on coming out of the form. When the improved furnace before mentioned is not in use, a special polishing stove is necessary. This consists of an iron slab covering a vault, heated by a fire beneath. The sticks are taken in the hand and held in the heat of the polishing stove till the surfaces begin to melt and the sticks bend. For gilding, silvering, or bronzing, the part to be ornamented is touched with a brush dipped in 90% alcohol, and the gold or silver leaf or bronze powder is applied, and adheres tenaciously.

Composition.—The following recipes for the compounding of sealing waxes will be found to embrace all that are of general utility.

Black.—

1.	Shellac	15 parts.
	Turpentine	27 parts.
	Pine resin	20 parts.
	Chalk	12 parts.
	Soot	16 parts.
2.	Shellac	16 parts.
	Turpentine	12 parts.
	Resin	12 parts.
	Chalk	3 parts.
	Gypsum	2 parts.
	Vine black	7 parts.
3.	Shellac	48 parts.
	Turpentine	52 parts.
	Pine resin	46 parts.
	Chalk	28 parts.
	Soot	8 parts.
	Boneblack	8 parts.
	Asphaltum	8 parts.
4.	Shellac	2 parts.
	Yellow resin	3 parts.
	Ivory black	2 parts.

Powder fine and mix by melting carefully.

Fine.—

5.	Shellac	60 parts.
	Venice turpentime	20 parts.

Melt shellac carefully; add Venice turpentine; stir in 30 parts of finely powdered ivory black.

Common.—

6.	Resin	6 lb.
	Shellac	2 lb.

Melt; add 2 lb. Venice turpentine, and lampblack to color.

7. Black Bottle Sealing Wax.—Take 6 parts of resin; 3 parts paraffin, melt together. Add 28½ parts of lampblack. Another color can be produced by taking about 5 to 7 parts to 100 parts of the mass, of chrome yellow, ultramarine, etc.

Blue.—

1.	Shellac	7 parts.
	Turpentine	6 parts.
	Pine resin	3½ parts.
	Magnesia	1 part.
	Chalk	2 parts.
	Blue coloring matter	2 to 2½ parts.
2.	Shellac	2 parts.
	Smalts	1 part.
	Yellow resin	2 parts.

Powder and mix carefully with heat.

Light Brown.—Take 7⅛ oz. shellac and 4 oz. Venice turpentine, and color with 1 oz. brown ocher and ½ oz. cinnabar (red sulphuret of mercury or vermilion).

Brown.—

	Shellac	4 parts.
	Turpentine	12 parts.
	Pine resin	8 parts.
	Gypsum	4 parts.
	Chalk	4 parts.
	Umber	4 parts.

The shellac for preparing chocolate brown sealing wax must not be too dark. The product of the above recipe is dark brown, and unbleached shellac and dark resin may be used for preparing it.

Deed.—

1.	Light colored rosin	12 parts.
	Turpentine	7 parts.
	Clarified tallow	6 parts.
	Whiting	8 parts.
	Minium	6 parts.

2. White wax	10	parts.
Turpentine	3	parts.
Cinnabar	2	parts.
Glycerine	1	part.

The ingredients are melted together and stirred while cooling off until they congeal.

3. Colophony	12	parts.
Tallow	6	parts.
Turpentine	12	parts.
Chalk	16	parts.
Minium	16	parts.

Green.—

1. Shellac	14	parts.
Turpentine	16	parts.
Pine resin	8	parts.
Magnesia	3	parts.
Berlin blue	5	parts.
Chrome yellow	5	parts.

2. Shellac	15	parts.
Turpentine	12	parts.
Pine resin	24	parts.
Gypsum	4½	parts.
Chalk	6	parts.
Mountain blue	9	parts.
Ocher	9	parts.

Green ultramarine may be used to advantage for the finer qualities, instead of a mixture of colors.

Letter, Without a Light.—

Colophony	3	parts.
Resin	3	parts.
Suet	3	parts.
Venice turpentine	4	parts.
Pulverized carbonate of lime	4	parts.
Pulverized minium	4	parts.

Melt the first 3 ingredients together, then add the others in succession, stirring constantly till cold.—*Moniteur Quesneville.*

Parcel.—

1. Shellac	7	parts.
Rosin	13	parts.
Turpentine	10	parts.
Oil of turpentine	1	part.
Chalk	3	parts.
Gypsum	2	parts.
Cinnabar	5	parts.

2. Shellac	6	parts.
Rosin	24	parts.
Turpentine	15	parts.
Oil of turpentine	1½	part.
Chalk	9	parts.
Gypsum	16	parts.
Minium	18	parts.

3. Shellac	1½	part.
Resin	8½	parts.
Turpentine	6	parts.
Oil of turpentine	½	part.
Chalk	2	parts.
Brickdust	1	part.
Colcothar	5	parts.

4. Colophony	20	parts.
Pine resin	10	parts.
Turpentine	5	parts.
Chalk	7½	parts.
Oil of turpentine	⅛	part.

5. For brown, 10 parts umber or bole are added to No. 4.

Reds.—Very fine reds are—

1. Shellac	24	parts.
Turpentine	16	parts.
Cinnabar	18	parts.
Oil of turpentine	4	parts.
Magnesia	6	parts.

2. Shellac	10	parts.
Turpentine	6	parts.
Oil of turpentine	1	part.
Chalk	1	part.
Magnesia	2	parts.
Cinnabar	8	parts.

3. Shellac	20	parts.
Turpentine	5	parts.
Oil of turpentine	1	part.
Chalk	3	parts.
Gypsum	3	parts.
Magnesia	½	part.
Cinnabar	12	parts.

Common.—

4. Resin	4	lb.
Shellac	2	lb.

Melt. Mix in

Venice turpentine	¾	lb.
Red lead	¾	lb.

5. Fine.—Melt cautiously 4 oz. pale shellac in a copper vessel, at the lowest possible temperature; add 1¼ oz. of Venice turpentine, previously warmed, and stir in 3 oz. vermilion, pour into metallic moulds and allow it to cool.

6. Shellac	50	parts.
Venice turpentine	12½	parts.
Chinese vermilion	37½	parts.

Medium Fine Reds.—

1. Shellac	1	part.
Turpentine	8	parts.
Oil of turpentine	½	part.
Chalk	8	parts.
Magnesia	1	part.
Cinnabar	6	parts.

2. Shellac	12	parts.
Resin	8	parts.
Oil of turpentine	3	parts.
Turpentine	14	parts.
Chalk	3	parts.
Gypsum	3	parts.
Cinnabar	9	parts.

3. Shellac	4	parts.
Resin	6	parts.
Turpentine	6	parts.
Oil of turpentine	½	part.
Chalk	2	parts.
Gypsum	1	part.
Cinnabar	4	parts.

Fine Red.—

Shellac	55	parts.
Turpentine	74	parts.
Chalk or magnesia	30	parts.
Gypsum or zinc white	20	parts.
Cinnabar	13	parts.

Ordinary Red.—

1. Shellac	52	parts.
Turpentine	60	parts.
Pine resin	44	parts.
Chalk	18	parts.
Cinnabar	18	parts.

2. Rosin	50	parts.
Red lead	37½	parts.
Turpentine	12½	parts.

Gold Sealing Wax.—Melt cautiously 4 oz. pale shellac in a copper vessel, at the lowest possible temperature; add 1¼ oz. of Venice turpentine, previously warmed; and stir in 3 oz. mica spangles; pour into metallic moulds, and allow it to cool.

Translucent.—A beautiful variety (aventurin), which can be prepared at comparatively low cost, is obtained by stirring finely powdered mica into the melted ground mass. Gold and silver waxes are obtained by mixing finely powdered leaf metal with the melted ground mass. Ground masses for translucent wax are:

1. Bleached shellac	3	parts
Viscid turpentine	3	parts.
Mastic	6	parts.
Chalk	2	parts.

2. Bleached shellac	15	parts.
Viscid turpentine	20	parts.
Mastic	25	parts.
Sulphate of baryta	15	parts.

Or—

Nitrate of bismuth	15	parts.

3. Bleached shellac	3	parts.
Viscid turpentine	4	parts.
Mastic	5	parts.
Nitrate of bismuth	3	parts.

Cheap Sealing Wax.—The following recipe furnishes a cheap sealing wax, useful for many purposes. Melt together—

1. Common beeswax	2	lb.
Turpentine	6	oz.
Olive oil	2	oz.
Red lead	6	oz.

Boil a little, and stir until it is almost cold; then cast it into cold water, and make it up into rolls or cakes.

2. Resin	4	lb.
Shellac	2	lb.
Venice turpentine	1½	lb.
Red lead	1½	lb.

Mix and melt.

Colored Sealing Wax.—

Pale shellac	4	oz.
White resin	1¼	oz.
Venice turpentine	2	oz.

Add a finely powdered pigment of the required color.

Colorless Sealing Wax.—

Beeswax	11	parts.
Turpentine	3	parts.
Rhine oil	1	part.
Shellac	5	parts.

Mix with heat.

Soft Sealing Wax for Diplomas.—

Yellow wax	24	parts.
Turpentine	4½	parts.
Olive oil	1½	parts.

After these ingredients are melted, stir in cinnabar, or other coloring matter.

Sealing Wax, to Dissolve.—Buy the best fine sealing wax, break up as small as possible, and put into a bottle containing methylated spirit; leave for a day or two to thoroughly dissolve, unless in a hurry, when the process may be hastened by keeping the bottle immersed in warm—but not boiling—water, or you will have an explosion.

To Make Sheet Wax.—Dr. H. E. Beach, Clarksville, Tenn., says: Take of pure clean wax anywhere from 1 to 5 lb., put in a tin bucket or any deep vessel, with clear water sufficient to fill it within 2½ in. of the top. Set on the stove till thoroughly melted, then set aside until partially cooled; skim all the air bubbles off. Then fill a smooth, straight bottle with ice water, a bucket of which you should have by you. Soap the bottle and dip it deliberately in the solution two or more times, according to the thickness you desire your wax. After the last dip, as soon as the wax hardens to whiteness, cut a line through it and remove it from the bottle as quickly as possible. Spread to cool and straighten out smooth while warm. Continue this process until all the wax is made into sheets.

Any office boy or girl can do the work, and make enough sheet wax in an hour—equal to any you can buy—to last a whole year. Paraffine, or paraffine and wax, may be made in the same way, and colored and perfumed to suit one's fancy. The water in the bottle should always be kept cold, in order to get the best results.—*Archives of Dentistry.*

Shoemakers' Wax.—This is made by melting together the best Swedish pitch and tallow in a vessel over the fire. The quantity of tallow must be determined by experiment. Roll into balls. The right kind of pitch is of a brown color when fractured.

Waxing Soap Papers.—Ordinary waxed paper is prepared by placing cartridge or other paper on a hot iron, and rubbing it with beeswax, or by brushing in a solution of wax in turpentine. On a large scale, it is prepared by opening a quire of paper flat upon a table, and rapidly ironing it with a very hot iron against which is held a piece of wax, which melting, runs down upon the paper and is absorbed by it. Any excess on the topmost layer readily penetrates to the lower ones.

Sugar Cane Wax.—Cerosin.—Obtained by rasping the bark of the cane, and purifying by recrystallization from boiling alcohol. Its composition is said to be $C_{48}H_{96}O_2$. Melts at about 82° C.

Wax for Waxing Threads to be Woven.—

Melted beeswax	2½ parts.
Pulverized soap stone	½ part.
Pulverized graphite	2 parts.

Tree Wax.—Sixty parts finely powdered lime, 20 parts of fine charcoal are mixed with q. s. of linseed oil. Apply with a brush.

Wax Milk.—Boil 1 part yellow soap, 3 parts Japanese wax in 21 parts water, until the soap dissolves. Used for polishing carved woodwork.

Weeds, to Destroy.—1. The best way, says a correspondent, to apply salt to paths, to destroy weeds, is as follows: Boil the salt in water, 1 lb. to 1 gal., and apply the mixture boiling hot with a watering pot that has a spreading rose; this will keep weeds and worms away for two or three years. Put 1 lb. to the square yd. the first year; afterward a weaker solution may be applied when required.

2. The plants should be cut off close to the ground and a few drops of coal oil poured on to the crowns. They immediately commence to decay and are utterly destroyed. Troublesome weeds on the lawn can thus be speedily disposed of, but others will likely take their place.

Weight, Measures of. See **Appendix.**

Weights and Measures. See **Appendix.**

Welding, Simple Directions for.—The great secret of welding is to have a clean fire, then heat the iron and "strike while the iron is hot." Make the fire of blacksmiths' coal which has been caked (coke). If the work is small have only a little fire. As the weld requires considerable pounding, plenty of stock should be left by using generous laps. Be sure the laps fit well before welding. When the iron gets from a red to a white heat sand the iron without removing from the fire and watch the iron carefully. When it sparks freely and has a glazed appearance, remove from the fire, lay quickly, after a shake to remove the oxide, and pound the lap well until the iron becomes too cold to work.

Welding, Composition for.—1. To 20 parts of iron filings, add 10 parts of borax and 1½ part sal ammoniac, and 1 part of balsam of copaiva or other resinous oil. Mix well, heated and pulverized. The surfaces to be united are powdered with this mixture; after which place the article in the fire and let it come to a cherry red heat; when the composition melts, take the portions to be welded from the fire and join together. This composition is used in Germany with great success.

2. Another composition for welding consists of thirty parts of borax, 4 parts of sal ammoniac, and 4 parts of cyanide of potash. Dissolve in water, and then evaporate the water at a low temperature.

Copper, Welding.—1. (Rust.) Prepare a mixture of 358 parts soda phosphate, 124 parts boracic acid; apply the powder when the metal is at a dull red heat; it is then brought to a cherry red and at once hammered. As the metal is apt to soften when exposed to a high degree of heat, a wooden hammer is recommended. Remove all carbonaceous matter from the surfaces to be joined, as the success of the operation depends on the formation of a fusible phosphate of copper. The phosphate of copper dissolves a thin film of oxide on the sur-

faces of the metal, keeping them clean, and in condition to weld.

Weldable by Electricity.—Following is a list of the different materials which have been successfully welded together by the Thompson process, which may be of interest, inasmuch as the term welding is ordinarily used with especial reference to the joining of two pieces of material of the same or closely allied composition:

Metals.—Wrought iron, cast iron, malleable iron, wrought copper, cast copper, lead, tin, zinc, antimony, cobalt, nickel, bismuth, aluminum, silver, platinum, gold (pure), manganese, magnesium.

Alloys.—Stubs steel, cast brass, gun metal, chrome steel, Mushet steel, Crescent steel, Bessemer steel, steel castings, brass composition, various grades of tool steel, various grades of mild steel, fuse metal, type metal, coin silver, solder metal, German silver, silicon bronze, aluminum brass, phosphor bronze, aluminum bronze, various grades of gold, aluminum alloyed with iron.

Combinations.—

Copper to brass.
Copper to wrought iron.
Copper to German silver.
Copper to gold.
Copper to silver.
Brass to wrought iron.
Brass to cast iron.
Tin to zinc.
Tin to brass.
Brass to German silver.
Brass to tin.
Brass to mild steel.
Wrought iron to cast iron.
Wrought iron to cast steel.
Wrought iron to mild steel.
Wrought iron to tool steel.
Gold to German silver.
Gold to silver.
Gold to platinum.
Silver to platinum.
Wrought iron to Mushet steel.
Wrought iron to Stubs steel.
Wrought iron to Crescent steel.
Wrought iron to cast brass.
Wrought iron to German silver.
Wrought iron to nickel.
Tin to lead.

It will be seen from the foregoing that materials heretofore impossible to weld to pieces of similar composition have been welded, and not only this, but different combinations have been made, which are entirely impossible by ordinary methods.

Fluxes, Welding.—1. A welding material composed of 25 parts by weight of borax, a paper or metallic support, and 60 parts metallic filings of the same nature as the metals to be welded, and made by first melting the borax; second, immersing the support in the fused borax; third, smoothing the same by passing it through pressure rollers; fourth, sprinkling its two faces with the metal filings; fifth, heating the sheet in an oven; sixth, passing through pressure rollers.

2. A welding material composed of borax and of metallic filings of the same nature as the metals to be welded, mixed with the fused borax, and in the proportions substantially as set forth, and then rolled out into sheets of about $\frac{1}{8}$ in. thick.

3. The welding sheets coated with a layer of gum lac or other appropriate varnish.

The following compound has been frequently offered as a trade secret: Take copperas, 2 oz.; saltpeter, 1 oz.; common salt, 6 oz.; black oxide of manganese, 1 oz.; prussiate of potash, 1 oz. Pulverize these ingredients and mix with them 3 lb. nice welding sand.

Iron and Steel together, Welding.—Nothing is better than borax and good management. Have the iron sparkling hot. Steel bright cherry. Make the weld at first blow. Long experience necessary.

Powder, Welding.—Belgian Welding Powder.—1. Iron filings, 800 parts; borax, 400 parts; balsam of copaiba or other resinous oil, 40 parts; sal ammoniac, 60 parts. Mix, heat, and pulverize finely. Powder the surfaces to be welded, bring to a cherry red heat, at which the powder melts; take from the fire and join.

2. Calcine and pulverize together 50 parts iron or steel filings, 5 parts sal ammoniac, 3 parts borax, 2½ parts balsam copaiba. Heat one of the pieces to be welded red, carefully clean off scale, spread the powder upon it; apply the other piece at a white heat, and weld with a hammer. Used for welding iron and steel, or both, together.

Steel, Welding to Cast Iron.—Heat the steel to cherry red (after it is shaped to correspond to the surface of the cast iron to which it is to be joined). Apply borax to the surfaces to be welded. Heat the parts to a welding heat. Apply strong pressure, without hammering, which will securely weld the steel and iron.

Steel Welding.—1. An excellent composition for welding cast steel is prepared by boiling together 16 parts borax and 1 part sal ammoniac over a slow fire for 1 hour. When cold, grind it to powder. The steel must then be made as hot as it will conveniently bear, and the composition used the same as sand.

2. Take copperas, 2 oz.; saltpeter, 1 oz.; common salt, 6 oz.; black oxide of manganese, 1 oz.; prussiate of potash, 1 oz.; pulverize and mix with welding sand, 3 lb. Use it in the same way as you would sand.

3. Ten parts borax, 1 part sal ammoniac; pulverize together thoroughly, with which sprinkle the parts to be welded.

Welding Cast Steel.—4. To make composition used in welding cast steel, take of borax 10 parts; sal ammoniac, 1 part; grind or pound roughly together; then fuse in a metal pot over a clear fire, continuing the heat until all spume has disappeared from the surface. When the liquid appears clear, the composition is ready to be poured out to cool and concrete. To prepare it for use it is ground to a fine powder. The steel to be welded is raised to a bright yellow heat, and then dipped into this welding powder; it is then placed in the fire again; and when it attains the same heat as before, it is ready to be placed under the hammer.

5. A mass of ingredients is sold for the purpose of welding cast steel, but the simplest and best method is, according to the *Revue Industrielle*, the one employed by Fiala, of Prague, Bohemia. He uses pulverized white marble for the purpose. The two pieces to be welded together are heated, and, after rolling in marble dust, are promptly joined together, and subjected to a good hammering.

6. Welding Cast Steel Without Borax.—Copperas, 4 parts; saltpeter, 2 parts; prussiate of potash, 2 parts; black oxide of magnesia, 2 parts; common salt, 12 parts; all pulverized. Mix with good welding sand 48 parts, and use precisely the same as you would sand.

7. Composition for Welding Cast Steel.—Slightly color pulverized borax with dragon's blood. Heat the steel red hot, shake the borax over it. Place in the fire until the borax smokes, which will be much below ordinary welding heat; then hammer the steel.

8. Composition Used in Welding Cast Steel.—Borax, 15 parts; sal ammoniac, 1½ part; grind or pound together; fuse, continuing the heat until all scum has disappeared from the surface. When the liquid is clear pour out to cool, then grind to a fine powder. Heat the steel to be welded to a bright yellow, dip in the welding powder, place in the fire again, until it attains the same degree of heat as before. Then place under the hammer.

9. Shear and double shear steel are easily welded, and the latter will answer almost all the

purposes of cast steel. Cast steel, however, is more difficult to weld, but it can be done by practice. Care must be taken not to heat too hot, or it will fall to pieces under the hammer. Use powdered borax as a flux.

Whale Oil. See **Oils.**

Whisky. See **Liquors.**

White Alloys. See **Alloys.**

White Metal. See **Alloys.**

White Pigments. See **Pigments.**

Whitewash.—1. A good durable whitewash is made as follows: Take ½ bushel of freshly burnt lime, slake it with boiling water; cover it during the process, to keep in the steam. Strain the liquid through a fine sieve, and add to it 7 lb. of salt previously well dissolved in warm water; 3 lb. of ground rice boiled to a thin paste and stirred in boiling hot; ½ lb. of powdered Spanish whiting; 1 lb. of clean glue, which has been previously dissolved by soaking it well, and then hanging it over a slow fire in a small kettle, within a large one filled with water. Add 5 gal. of hot water to the mixture, stir it well, and let it stand a few days covered from dirt. It must be put on quite hot. For this purpose it can be kept in a kettle on a portable furnace. About 1 pt. of this mixture will cover a square yard.

2. A Wash for Fences, etc.—White lime, ½ bushel; hydraulic cement, 3 pecks; umber and ocher, each 10 lb.; Venetian red, 1 lb; lampblack, ¼ lb.; slake the lime, shake up the lampblack with a little vinegar, mix well together, add the cement, and fill the barrel with water. Let it stand several hours; stir frequently. A larger proportion of ocher gives a darker color. Use only 1 coat. This is said to look well after five years' use.

3. Whitewash that Will Not Rub Off.—Mix ½ pt. flour with water; pour on boiling water enough to thicken it. Pour while hot, into a pailful of lime and water, which has been mixed ready to put on the wall. Stir all well together.

4. *Whitewash, U. S. Government.*—The following coating for rough brick walls is used by the U. S. government for painting lighthouses, and it effectually prevents moisture from striking through: Take of fresh Rosendale cement, 3 parts, and of clean, fine sand, 1 part; mix with fresh water thoroughly. This gives a gray or granite color, dark or light, according to the color of the cement. If brick color is desired, add enough Venetian red to the mixture to produce the color. If a very light color is desired, lime may be used with the cement and sand. Care must be taken to have all the ingredients well mixed together. In applying the wash, the wall must be wet with clean fresh water; then follow immediately with the cement wash. This prevents the bricks from absorbing the water from the wash too rapidly, and gives time for the cement to set. The wash must be well stirred during the application. The mixture is to be made as thick as can be applied conveniently with a whitewash brush It is admirably suited for brickwork, fences, etc., but it cannot be used to advantage over paint or whitewash.

5. *Whitewash, Incombustible.*—Slake stone lime in a large tub or barrel with boiling water, covering the tub or barrel, to keep in all the steam. When thus slaked, pass 6 qt. of it through a fine sieve. It will then be in a state of fine flour. Now, to 6 qt. of this lime, add 1 qt. of rock or Turk's Island salt and 1 gal. of water; then boil the mixture and skim it clean. To every 5 gal. of this skimmed mixture add 1 lb. of alum, ½ lb. of copperas; by slow degrees, add ¾ lb. of potash and 4 qt. of fine sand or hickory ashes, sifted. We suppose any kind of good hard wood ashes will answer as well as hickory. This mixture will now admit of any coloring matter you please, and may be applied with a brush. It looks better than paint, and is as durable as slate. It will stop small leaks in the roof, prevent the moss from growing over and rotting the wood, and render it incombustible from sparks falling upon it. When laid upon brick work, it renders the brick impervious to rain or wet.

6. Well wash the ceiling by wetting it twice with water, laying on as much as can well be floated on, then rub the old color up with a stumpy brush and wipe off with a large sponge. When this is done, stop all the cracks with whiting and plaster of Paris. When dry, claircole with size and a little of the whitewash. If very much stained when this is dry, paint those parts with turps, color, and, if necessary, claircole again. To make the whitewash, take 1 dozen lb. of whiting (in large balls), break them up in a pail, and cover with water to soak. During this time melt over a slow fire 4 lb. common size, and at the same time, with a palette knife or small trowel, rub up fine about a dessertspoonful of blue black with water to a fine paste; then pour the water off the top of the whiting, and with a stick stir in the black; when well mixed, stir in the melted size and strain. When cold it is fit for use. If the jelly is too stiff for use, beat it well up and add a little cold water. Commence whitewashing over the window, and so work from the light; lay off the work into that done, and not all in one direction, as in painting. Distemper color or any tint may be made by using any other color instead of the blue black—as ocher, chrome, Dutch pink, raw sienna for yellows and buff; Venetian red, burnt sienna, Indian red, or purple brown for reds; celestial blue, ultramarine, indigo for blues; red and blue for purple, gray, or lavender; red lead and chrome for orange; Brunswick green for greens.

7. Whitewash for Outdoor Use.—Quicklime, ¼ bu.; slake, add ½ lb. common salt; ¼ lb. sulphate of zinc (white vitriol); 2 qt. sweet milk. Dissolve the salt and white vitriol before adding. Mix, with sufficient water to give the proper consistency. Apply as soon as possible.

8. Whitewash for Fences or Outbuildings.—Slack the lime in boiling water. To 1½ gal. ordinary whitewash add ½ pt. molasses and ½ pt. table salt. Stir frequently while applying. Two thin coats are sufficient.

To Keep Whitewash.—Keep the lime covered with water in a covered tub. If the water evaporates, the lime is useless, but if kept covered it will be good for a long time.

To Color and Prevent Whitewash from Rubbing Off.—Give the desired color by adding small quantities of lampblack, brown sienna, ocher, or other coloring material. Add alum to lime whitewash to prevent rubbing off.

Whitewash for Outdoor Use—Put into a water tight barrel ¼ bushel lime. Slake by pouring boiling water over it, enough to cover 5 inch deep, stirring until thoroughly slaked. When it is slaked add 1 lb. sulphate of zinc and ½ lb. common salt, dissolved in water.

The above wash may be made cream color by adding 1½ lb. yellow ocher.

Whitewash for Damp Walls.—For brickwork exposed to damp, take half a peck of well burned quicklime, fresh from the kiln, slake with hot water sufficient to reduce it to a paste, and pass it through a fine sieve; add a gallon of clean white salt which has been dissolved, in a small quantity of boiling water, and a thin, smooth paste, also hot, made from 1 lb. of fine rice flour; also ¼ of a lb. of the best white glue, made in the water bath. Mix together, stir well, add ¼ of a lb. of best Spanish whiting in 5 qt. of boiling water; stir, cover to retain heat and exclude dust, and let it stand a week. Heat to boiling, stir, and apply hot. The above proportions will cover forty square yards.—*Scientific American.*

Zinc Whitewash.—Common size mixed with oxide of zinc; apply to the ceiling with a brush. Then apply a wash of chloride of zinc. This

will combine with the oxide, and form a smooth cement, with a glossy surface.

Whitewash, a Waterproof.— Resenschek, of Munich, mixes together the powder from 3 parts of silicious rock (quartz), 3 parts broken marble and sandstone, also 2 parts of burned porcelain clay, with 2 parts of freshly slaked lime, still warm. In this way a wash is made which forms a silicate if often wetted, and becomes, after a time, almost like stone. The four constituents, mixed together, give the ground color, to which any pigment that can be used with lime is added. It is applied quite thickly to the wall or other surface, let dry one day, and the next day frequently covered with water, which makes it waterproof. This wash can be cleansed with water without losing any of its color; on the contrary, each time it gets harder, so that it can even be brushed, while its porosity makes it look soft. The wash, or calcimine, can be used for ordinary purposes, as well as for the finest painting. A so-called fresco surface can be prepared with it in the dry way.

Whiting.—Whiting is made from chalk ground with water; only the finer and lighter particles are taken. It is sometimes called whitening.

Whiting, to Make into a Polishing Cake.—Use plaster of Paris or dental plaster. Mix with water. Apply with a rag.

Whiting Balls.—Whiting can be pressed into balls after moistening it with thin gum water.

Wicks, Lamp, Incombustible. See **Fireproofing.**

Windows.—To keep frost, etc., off plate glass windows keep the inside air dry, or inner sash tight, so that the air in window inclosure will be cold, and ventilated from the outside. A partial remedy is to have ventilating openings in the top of the window casing.

Windows, to Clean. See **Cleansing.**

Windows, Frosty.—A thin coat of pure glycerine applied to both sides of the glass will prevent any moisture forming thereon, and will stay until it collects so much dust that it cannot be seen through. Surveyors can use it to advantage on their instruments in foggy weather. In fact, it can be used anywhere to prevent moisture from forming on anything, and locomotive engineers will find it particularly useful in preventing the accumulation of steam as well as frost on their windows during the cold weather.

Wines and Wine Making.

Wine Making.—The grapes are not removed from the vine until they are quite ripe. As the maturation not only of different varieties, but of the same kind, is dependent upon the season, no stated period can be fixed for the commencement of the vintage. The grapes are ready to be gathered when the white kind becomes of a brownish yellow color, and the red or blue, very dark purple or nearly black. Shears, pruning knives, or scissors, are used for the removal of the fruit from the vine.

In making the finer wines, previous to being pressed, the bunches are carefully examined, and any unripe or damaged grapes are picked off and used to make inferior wine, or in the gathering the unripe specimens are left on the branch to ripen. The blue and dark varieties, when intended for the best wines, are, with few exceptions, removed from the stalks before being pressed; the white grapes are pressed with the stalks.

Except with those grapes which produce wines that are likely to become viscous or ropy, the stalks are not left for any length of time in contact with the grape juice or must. There are various modes of separating the grapes from the stalks. One method consists in the employment of a wooden fork or trident, ½ yd. or more in length; by turning this round in a wooden pail filled with the fruit, the grapes become detached from the stalks, which are thus brought to the surface and removed.

In another contrivance the separation is effected by inclosing the bunches in cages made of parallel wires. Inside the cage there is a stirrer; when this is turned by an external handle, the grapes alone drop through the wires, leaving the stalks in the cage. Sometimes the separation is accomplished by means of hurdles, which are so manipulated that the fruit only shall pass through the meshes.

Previous to their being pressed, the grapes have to undergo the preliminary process of bruising or crushing. This is sometimes done by their being trodden under the naked feet of men, on a large wooden stage or platform; at other times the men wear heavy boots, while in some cases the grapes are placed in a vat and bruised with a kind of wooden pestle. Sometimes they are crushed between wooden grooved rollers. Of all these processes, the first, although the least cleanly, possesses the advantage of not crushing the pips or stalks, and is thus free from the risk of imparting an unpleasant flavor to the wine.

There is considerable divergence in the statements of different writers as to the yield of must or juice from ripe grapes. Payen says it amounts to from 94 to 96% of the total weight of the grape. Dupré and Thudichum obtained from three samples of grapes respectively 78·75%, 76·75%, and 72·25%. Wagner averages it from about 60 or 70%.

When a white wine is required, the bruised grape, whether of the white or red variety, is at once pressed, except when, as happens with some kinds of fruit, it is kept to allow of the development of the bouquet. The mode of procedure is different when a red wine is to be prepared. The crushed grapes must then be kept in a tub or vat, loosely covered over, until an examination of a small quantity of the juice shows it has acquired the necessary color. For it to do this sometimes takes from three or four days to a month.

During this period, alcohol has been formed in the pulp, and this, with the tartaric acid of the fruit, has dissolved out the coloring principle of the grape. Great care is necessary at this stage to prevent the too long exposure of the crushed and fermenting fruit to the air.

Wine presses are of various patterns.

In many wine making establishments, iron presses have supplanted wooden ones, over which they possess the advantages of greater cleanliness and non absorption of the must. The wine press in general use in the Gironde consists of a tall, round basket, made of perpendicular laths. The fruit is placed in this basket, and upon the fruit a wooden block, to which a screw is attached; a nut works upon the screw from above downward, and presses the wooden block upon the fruit, the liquid from which is forced out through the laths and collected.

In the manufacture of champagne and some red wines, very powerful presses are employed; but these possess the objection of pressing the fixed oil from the pips and an unpleasantly tasting juice from the stalks, and thereby damaging the product. In some establishments, centrifugal machines have been used, not only with the result of yielding a better wine, but of effecting a considerable gain in time and labor.

The must, being received into proper receptacles, next undergoes the vinuos fermentation. In the case of white wines the must is kept separate from that subsequently procured by submitting the husks, pips, and stalks to additional pressure, and is sold as the first or superior wine.

But with red wines the husks (and in some cases the marc) are thrown into the fermenting vat, by which means the wine acquires an additional amount of coloring matter. In this case, when the completed wine is drawn off, the husks are again pressed, and the wine so ob-

tained added to the first instalment. As the tannic acid is derived from the skins and seeds of the grape, wines prepared in this manner usually contain a considerable amount of this substance.

The fermentation is conducted in different countries at different temperatures, and, of course, with different results. When must is fermented at 15° to 20° Cent. (59° to 68° Fah.) it yields a wine strong in alcohol, but wanting in bouquet; while if the fermentation be carried on at 5° to 15° Cent. (41° to 59° Fah.) the product will be a wine rich in bouquet, but poor in alcohol.

The wines of Spain, the south of France, Austria and Hungary, are produced at the higher temperature, and those of Germany, for the most part at the lower one. The fermentation is carried on in large wooden vats. In some places vats of sandstone or brick are used for this purpose. The fermentation of white wines, such as those of the Rhine and Gironde, is effected in new and perfectly clean casks or hogsheads, the bunholes of which are left open to allow the escape of the carbonic acid. Opinions differ as to whether air should be admitted or not during fermentation. The process is undoubtedly quickened if the must be aerated. The aeration is sometimes performed by a bellows fitted with a rose nozzle. During the operation of blowing in, the must is to be kept at a low temperature, to prevent the volatilization of the bouquet. When the opposite method is followed, various devices are in use for excluding the air, or at any rate an excess of it. In some cases the vat, being provided with a suitable lid, has a hole, or is arranged with a tube, for the escape of the carbonic acid. Koles and Bamberger accomplish the same end, without letting in the external air, by means of a glass tube bent twice at right angles; one limb of the tube passes through the bunghole into the wine and the other or outer limb into a vessel of water. In another contrivance the lid of the vat is fitted with a valve, which, opening only outward, allows of the exit of the carbonic acid.

Red wines are fermented in large and, in most cases, open vats, fitted in the inside with perforated shelves, which, being below the surface of the liquid, prevent the husks rising to the top, and setting up acetous fermentation. After the completion of the fermentation of Burgundy wines, in some places it is the filthy custom for men to enter the vat, and by their vigorous movements to mix the contents.

It is satisfactory to learn that this particularly objectionable practice is getting somewhat into disuse.

The length of time necessary for the completion of the fermentation varies with the locality, the temperature of the apartment, and with the quality of the wine required. In France, for the ordinary descriptions of wine, it generally takes from three days to a week, and in Germany from one to two weeks; with the finer kinds of wine it occupies four, five or six weeks. The progress of the fermentation may be estimated from the specific gravity of the liquid, since as the fermentation proceeds, and the sugar is undergoing conversion into alcohol, the wine, of course, becomes more attenuated and its specific gravity diminishes. It has been calculated that half per cent. of the alcohol present in the wine escapes during fermentation, as well as a considerable quantity of carbonic acid. An apparatus has been invented for collecting these products, by causing them to pass into water by means of a hydraulic bung.

When the fermentation is over the wine is run into casks, any sediment, such as lees or yeast, being left behind in the fermenting vessel. It is most important that the casks used for this purpose should be absolutely clean. Before a cask is used a second time it should be thoroughly sulphured.

Those wines which contain a large amount of alcohol are sometimes allowed to remain in the fermenting vat until they have cleared; but weak wines are immediately drawn off into the cask, to prevent the setting in of the acetous fermentation. The casks must be filled to the bungholes. A second or minor fermentation takes place in the wine when in the cask, during which tartar or bitartrate of potash is deposited on the sides of the cask, and yeast at the bottom. This second fermentation should be allowed to go on at a low temperature, 5° to 10° C. (41° to 50° F.), and at a slow rate. In some cases it is made to extend to three or six months.

When the second fermentation is over, the casks are filled to the bunghole and securely closed, or the wine is at once drawn into fresh casks to be stored. In these it remains closely bunged up until more tartar is deposited, after which it may be racked off into bottles or casks. When wine is to be stored for any length of time it is necessary to repeat the racking off frequently. Racking is performed by means of a siphon inserted in the bunghole, or by a cock suitably fixed in the cask. If the racked wine is not perfectly clear, it is fined by the addition of isinglass, previously softened by soaking in a small quantity of wine. After the addition of the isinglass, the cask is then filled to the bunghole, closed, and remains undisturbed for about six weeks, and if, at the end of that time, it is not perfectly bright, it is made to undergo a second racking. In wine making countries, blood and solution of glue are sometimes used for fining red wines which contain much tannin. Milk is also occasionally employed for the same purpose. The racking should be performed in cool weather, and preferably in the early spring.

The manufacture of champagne differs in its details from that of the so-called still wine. The best wine is made from a black grape of very fine quality, known as the *Noirien*, or *Pineau*, and grown in the champagne district. None but the best selected grapes are used; all those that are rotten, unripe, or in any way unsound, being rejected. The grapes are gathered when they have attained their greatest size. The vintage commences early in October. To prevent the juice being colored by the skin of the grape, the fruit is submitted to pressure as quickly as possible after being gathered. Very powerful machines are employed for this purpose, since the champagne grape, unlike other varieties, is not previously crushed. Great care is taken to apply the pressure evenly and to conduct the operation with all expedition, for if this exceeds two hours the must will be colored. The grapes are sometimes pressed four times. In good seasons the must obtained from the different pressings is mixed together. In middling ones the first yield is kept for making the best wines, nor is the fourth mixed with the other two. The light colored must is first conveyed into a large vat, where it remains for six, twelve, or eighteen hours, according to the temperature.

At the end of this time certain vegetable matters that would damage the taste of the ensuing wine, as well as render it liable to a second fermentation, become deposited. Directly the must has cleared it is run into small barrels of 2,000 liters capacity, in which it undergoes fermentation. Sometimes the clearing of the juice is accomplished by filtration; at others, when the weather is warm and fermentation sets in so rapidly as not to allow the impurities to subside, it is run into casks filled with the fumes from burning sulphur; by this means the excessive fermentative action is arrested, and sufficient time is given for the dregs to settle. The juice having been made clear by either of the above methods, is drawn into barrels, which are arranged in rows in the cellars. The barrels are filled to the bung, the froth which is formed during the fermentation flow-

ing out at the bungholes. In some wine making establishments, the barrels are tightly bunged up, there being previously added to the contents 1% of brandy. The casks are opened at the end of December, and the wine fined by means of isinglass; this operation being conducted at the lowest possible temperature. If, at the end of a fortnight, it has not become bright, it is left for another fortnight, and then, if not clear, it undergoes a second fining. The fining process must be used with caution; when overdone it diminishes, and frequently stops the activity of the subsequent fermentation. To obviate this, the wine should be judiciously exposed to the air, and a minute quantity of yeast added to each hogshead before it is bottled.

When the wine has cleared, before being bottled, cane sugar is added to it, since the quantity of undecomposed natural sugar in the wine is not sufficient to furnish the requisite amount of carbonic acid gas, the ingredient to which champagne owes its effervescent properties.

Champagne bottles constitute a very considerable item in the trade expenses of the wine maker. He pays the glass manufacturer 28 francs a hundred for them; and some wine makers give orders for as many as from 50,000 to 250,000 at a time.

The bottles as they arrive are examined by an experienced person, and those which contain flaws of any kind, or are not perfectly new, symmetrical, and strong are rejected. These average about 10%. The bottles are required to be as nearly as possible of uniform weight and thickness. The inside of each bottle is scrubbed by means of a revolving hair brush and clean water. After being drained, the bottles are rinsed with 90% alcohol and closed with an old but clean cork. They are thus ready, when required, for filling. The wine maker also expends a large amount of money in the purchase of corks, which must be of the best and soundest description. It has been found to be very false economy to use inferior kinds. The wine being drawn into bottles to a height of 2 or 3 inches from the top of the neck, the bottles have next to be corked, the cork being secured in the bottle by a small iron band, called an *agrafe*. All these operations have to be performed deftly and rapidly by experienced workmen. With what speed they are accomplished may be imagined from the fact that an *atelier* of five workmen, who divide the labor, will bottle and cork from twelve to fifteen hundred bottles daily, two bottles passing through all hands in one minute. The corking, etc., finished, the bottles are next placed on their sides, and stacked in cellars or caves, each stack being supported by thin laths.

As the summer approaches, the wine begins to show signs of fermentation, which increases with the hot weather. When the fermentation reaches such a stage as to cause the wine to occupy the previously unfilled space in the neck of the bottle, a large number of bottles begin to burst, as well as to leak; and in some years as much as 30% of the wine is lost from these causes, Two courses, each of which requires to be promptly adopted, are open to the wine maker under these circumstances. Either he must remove the wine to a cooler cellar, or uncork the bottles. Sometimes, if the breakage, or *casse*, as it is termed, has not exceeded 7% or 8% by the time August is reached, he takes the chance of further loss, and lets the wine remain, for with the fall in temperature, which usually occurs in September and October, the energetic action of the wine ceases, and the breakage also.

The leaky and broken bottles are then removed from the sound ones, which are restacked and left until a yeasty substance has discontinued depositing upon their lower sides. The bottles are kept in this condition until required for sale. Before, however, they are in a fit state for the purchaser, the yeasty matter has to be removed, and the wine to be liqueured. The yeast is got rid of as follows: The bottles are placed necks downward, on perforated shelves arranged in rows. A workman then seizes a bottle, and holding it in the inverted position, by a dexterous movement discharges the yeast from the side and brings it down upon the cork. This operation, which extends over some weeks, has to be repeated from time to time, until the supernatant wine is quite clear. The bottles are then very cautiously removed from the cellars to the corking and tying down rooms, when they come into the hands of a workman called a disgorger. The disgorger, holding the bottle still neck downward, proceeds to liberate the cork, by slipping off the *agrafe*, and when the cork is three parts out he quickly inverts the bottle. The cork is then forcibly ejected with a loud report by the froth, which carries with it the greater part of the yeast and other solid matters, what remains of these being got rid of by the workman working his finger round the neck of the bottle, whereby they are detached, and forced out by the still rising froth. The workman then places his thumb over the mouth of the bottle, which is afterward temporarily closed with an old cork.

The liqueur, which is next to be added, is of very varied composition, as almost every champagne maker has his favorite and special preparation.

The best liqueurs are made of some choice wine, mixed with the purest cane sugar. The inferior kinds consist of a mixture of 90% alcohol, sugar and some flavoring material. A certain measured quantity of the liqueur is added to each bottle of wine. The bottle is then corked, wired, tied down and washed, and the cork covered with tin foil and labeled. It is then ready for sale and export. It sometimes happens that after the previous round of operations has been gone through, the champagne becomes turbid, and a minor second fermentation sets in. In this case, it is made to undergo a repetition of the processes already described. It is a desideratum with every champagne maker that when the bottle is opened for its contents to be drunk, the removal of the cork should be accompanied with a full, deep, and distinct report. When, instead of this, the report is short and sharp, and resembles a popping noise, this is owing to the space between the liquid and the cork, filled with the gas, being too small. When the gas escapes with a hissing noise, it is because the cork fits the neck of the bottle unequally, or has not been driven in in a perfectly straight direction. The good name of any maker would be seriously damaged were he to send out champagne liable to comport itself in this manner. He therefore spares no expense in providing himself with the very best and soundest corks. The best way to prevent the escape of the gas from the bottle is always to keep the bottles lying on their sides.

All effervescing wines are manufactured in a similar manner to champagne.

Since the alcohol in the wine is derived from the sugar contained in the must, it would seem that the sweetest and ripest grapes should yield the strongest product. When the decomposition of the sugar has been complete, this will be the result; but it frequently happens that, owing to an insufficiency in the must of the protein compounds which nourish the yeast cells (the *torula cerevisiæ*), by the agency of which the fermentation is accomplished, the whole of the sugar is not converted into alcohol, in which case a sweet wine will be produced; or the sweetness may be due to the alcohol formed stopping the fermentation before all the sugar had been decomposed, or to an excess of glycerin. If on the other hand, the grape juice is rich in albuminous matter, but poor in sugar, the consequent wine will be what

Table Showing the Quantity of Alcohol in Wine.

Names, etc.		Alcohol of 0·7937 per cent. by weight.	Proof spirit per cent. by volume.
Port	Weakest	14·97	31·31
	Mean of 7 samples	16·20	34·91
	Strongest	17·10	37·27
	White	14·97	31·31
Sherry	Weakest	13·98	30·84
	Mean of 13 wines, excluding those very long kept in cask	15·37	33·59
	Strongest	16.17	35·12
Madeira	Mean of 9 wines long kept in cask in the East Indies	14·72	31·30
	Madre da Xeres	16·90	37·06
	Long kept in cask in the East Indies — Strongest	16·90	37·06
	Long kept in cask in the East Indies — Weakest	14·09	30·86
Teneriffe (long in cask at Calcutta)		13·84	30·21
Cercial		15·45	33·65
Lisbon (dry)		16·14	34·71
Shiraz		12·95	28·30
Amontillado		12·63	27·60
Claret (a first growth of 1811)		7·72	16·95
Chateau-Latour (a first growth of 1825)		7·78	17·06
Rosan (second growth of 1825)		7·61	16·74
Ordinary Claret (Vin Ordinaire)		8·99	18·96
Rivesaltes		9·31	22·35
Malmsley		12·86	28·17
Rüdesheimer, first quality		8·40	18·44
Rüdesheimer, inferior		6·90	15·19
Hambacher, superior quality		7.35	16·15

—*Dr. Christison.*

is termed a dry one. Such are the red wines of France and the Rhine.

According to Wagner, red French wines contain 9 to 14% by volume of alcohol. Burgundy, 9, 10, and 11%. Bordeaux, 10, 11, and 12%. Other French wines contain 8 to 10%; the wines of the Palatinate, 7 to 9·5%; Hungarian wines, 9 to 11%. Champagne contains 9 to 12%; Xeres, 17%; Madeira, 17 to 23·7%

In addition to ethylic alcohol and water, which, as shown in the previous table, vary largely in the proportions in which they are present in different kinds of wine, most wines contain the following substances: Propylic, butylic, caprylic and caproic alcohols; acetic and œnanthic ether; grape sugar(dextrose and levulose); glycerin; gums; pectin; coloring and fatty substances; protein bodies; carbonic acid, ordinary and levo-tartaric and racemic acids; citric acid; malic acid; tannic acid; acetic acid; lactic acid; succinic acid; organic and inorganic salts.

Of these, the propylic and butylic, caprylic, and caproic alcohols, the ethers, the glycerin, the carbonic, acetic, lactic, and succinic acids are produced during fermentation, the remaining substances being original constituents of the grape juice, which also contains bitartrate of potash; but this being insoluble in weak spirit, is thrown down or deposited as the conversion of sugar into alcohol proceeds. In its crude condition, it is known as argol, and is the source of cream of tartar and tartaric acid. As a result of its formation in the grape a considerable amount of free acid is removed from the fruit. This is why wine made from grapes is so much superior, and keeps so much better than that manufactured from fruits that abound instead in citric and malic acids. These latter require the addition of large quantities of sugar to disguise their acidity, a proceeding which frequently gives rise in them to a second fermentation, and often to the consequent formation of acetic acid. The acetic ether in wine is produced by the mutual reaction of acetic acid and ethylic alcohol. Neubauer, dissenting from Dupré and Thudichum, says the œnanthic ether is the constituent to which wines owe their bouquet. He regards this ether as a combination of various substances of which caprylic and caproic acid ethers are the most important. Their formation is believed to take place partly during and partly after fermentation. The rest of the non-volatile constituents, such as the sugar, the gum, the protein bodies, coloring matter, inorganic salts, etc., which remain behind when a wine is evaporated to dryness, constitute, with a certain quantity of substance the composition of which has not been defined, the extractive matter.

The amount of extractive matter in wines varies as greatly as from 1% to 20%. This difference occurs even in wines of a similar character, and from the same district. Thus in Rhine wines it ranges from 10·6% to 4·2%, in the Palatinate wines, from 10·7% to 1·9%, in Bohemian wines, the mean is 2·26%, in the wines of Austria, 2·64%, and in those of Hungary, 2·62%. It is highest in sweet wines. In many adulterated wines, as the extractive matter is either very small or sometimes altogether absent, it has been proposed to employ the estimation of its amount in a wine as a test of its genuineness or the reverse.

Light wines owe their color, varying from pale yellow to brown, possibly to oxidized extractive matter, or to the cask. The color of red wine is due to the action of its free tartaric acid on a blue substance residing in the skin of the grape. This body, which is known to wine makers as wine blue, and which bears a great resemblance to litmus, in turning red when acted upon by acids, was named *œnocyan* or *œnocyamin*, by Mulder or Maumené. It is insoluble in water, alcohol, ether, olive oil, and oil of turpentine, but is dissolved by alcohol containing small quantities of tartaric or acetic acid. Glycerin was found to be a normal constituent of wine by Pasteur in 1859. As the wine matures, the glycerin disappears. In Austrian wines, Pohl found 2·6% of glycerin. In some wines it reaches 3%, but in most it seldom exceeds 1%. In old wines it exists only in very small quantity. Faure states that another normal constituent of wine is a gum, to which is given the name *œnanthin*.

The ash of wine, as might be expected, con-

tains the same fixed constituents as that of the grape juice, and in both the potash and phosphoric acid largely predominate.

As the excellence and character of a wine depend, in addition to its peculiar bouquet, upon the relative proportions of alcohol, free acid, and water, and as these are approximately constant in all wines of good quality, it is essential that the grape juice should not only contain such an amount of sugar as when fermented will yield the requisite quantity of alcohol (but since the goodness of the wine is inversely as its content of free acid), that the latter should not exceed a certain limit. The taste of a wine, however, is frequently a fallacious test as to the quantity of free acid in it. Of two wines, one containing more free acid than the other, the latter may be less sour to the palate, provided it contains a larger proportion of sugar, glycerin, or alcohol than the former.

Apart from the consideration, whether the acid of the grape eventually becomes transformed into sugar or not, the fact remains that in sunless and wet years, when the fruit has not sufficiently ripened, there is a deficiency of sugar, and an access of acid. Fresenius states that the proportions are in—

Grapes grown in a very inferior year as 1 part of acid to 12 parts of sugar. Grapes grown in a better year as 1 part of acid to 16 parts of sugar. Grapes grown in a good year as 1 part of acid to 24 parts of sugar.

According to the same authority, when the proportion reaches 1 part of acid to 10 parts of sugar the grape is unsuited for making wine.

To get over the difficulty of dealing with a must that contains too low a proportion of sugar and too high a one of acid, two methods are adopted by the wine maker. The first, which was proposed by Chaptal, in an essay on the cultivation of the grape, published so long ago as 1800, consists in adding raw sugar to the must, in quantity sufficient to yield the amount of alcohol in which the wine would be otherwise deficient. Chaptal calculated that 2 parts of sugar would give 1 part of alcohol. If, therefore, the grape juice should be found upon analysis capable of producing a wine with only 8% of alcohol, instead of its normal amount, say, of 16% after fermentation for every 100 parts of wine to be manufactured, 16 parts of sugar would have to be added. When the amount of free acid in the must exceeds 6 parts in 1,000, powdered marble is added, in the proportion of 50 parts of marble for every 60 parts of acid in excess. This method is inapplicable if the acid exists as acetic.

By Gall's method, when the free acid in the must exceeds 0·6%, the juice is diluted with water to that strength. In this case the percentage of sugar will also have been reduced. Gall believed a normal must should have the following composition:

Sugar	24·0%
Free acid	0·6%
Water	75·4%

One hundred parts by weight of such a must would therefore contain 24 parts of sugar, 0·6 part of free acid, and 75·4 parts of water. If by examination a sample of grape juice should be found to contain, say, 16·7% of sugar and 0·3% of free acid, to bring it up to Gall's standard, it would be necessary to add to every 1,000 lb. of such juice 153 lb. sugar and 180 lb. of water.

Grape sugar made from starch and dilute sulphuric acid is usually employed for this purpose, but such sugar has the objection of containing large quantities of dextrin, the presence of which injures the keeping power of the resulting wine. The wine produced by Gall's plan is said to be very pleasant, and not devoid of natural bouquet. Sometimes the wine maker adds a flavoring material to it. The process seems best adapted for those musts which are poor in sugar, but contain an excess of free acid. The removal of this may also be satisfactorily accomplished by the use of neutral tartrate of potash. Among other methods practiced for increasing the alcoholic content of wine, is that of submitting it to a temperature at or below freezing, whereby a considerable quantity of its water becomes congealed, and may be separated along with some tartar, and coloring and albuminous matters, which are precipitated by the cold. Owing to the removal of these last from the wine, it is not so liable to undergo a second fermentation, while the abstraction of part of its water, of course, makes it richer in alcohol.

Gypsum is also frequently added to wines for the purpose of withdrawing some of their water, and therefore of increasing their strength. This it does, but only to a trifling extent. At the same time, it should be remembered that its addition to wine gives rise to the formation of soluble sulphate of potash, a bitter and active purgative, and wholly or partly removes the tartaric acid and the phosphates. Dupré and Thudichum have shown by experiment that this practice of plastering, as it is called, also reduces the yield of the liquid, as a considerable part of the wine mechanically combines with the gypsum and is lost.

Another reprehensible practice is the addition to the wine of brandy or of alcohol.

General Formulæ for the Preparation of Imitation Wines.—1. From ripe saccharine fruits.—Take of the fruit, 4 to 6 lb.; clear soft water, 1 gal.; sugar, 3 to 5 lb.; cream of tartar (dissolved in boiling water), 1¼ oz.; brandy, 2 to 3%; flavoring as required. If the full proportions of fruit and sugar are used, the product will be good without the brandy, but better with it. 1½ lb. raisins may be substituted for each pound of sugar.

In the above manner are made the following wines: Gooseberry wine, currant wine (red, white, or black), mixed fruit wine (currants and gooseberries, or black, red, and white currants; ripe black heart cherries and raspberries (equal parts), a good family wine; cherry wine, colepress's wine (from apples and mulberries, equal parts), elder wine, strawberry wine, raspberry wine, mulberry wine, whortleberry or bilberry wine; blackberry wine, damson wine, morella wine, apricot wine, apple wine, grape wine, etc.

2. From dry saccharine fruit (such as raisins).—Take of the dried fruit, 4½ to 7½ lb.; clear soft water, 1 gal.; cream of tartar (dissolved), 1 oz.; brandy, 1½ to 4%. Should the dried fruit employed be at all deficient in saccharine matter, 2 to 3 lb. of it may be omitted, and half that quantity of sugar or two-thirds of raisins added. In the above manner are made date wine, fig win, raisin wine, etc.

3. From acidulous, astringent, or scarcely ripe fruits, or those which are deficient in saccharine matter.—Take of the picked fruit, 2½ to 3½ lb.; sugar, 3½ to 5½ lb.; cream of tartar (dissolved), ½ oz.; water, 1 gal.; brandy, 2 to 6%.

In the above manner are made gooseberry wine, bullace wine, damson wine.

4. From footstalks, leaves, cuttings, etc.—By infusing them in water, in the proportion of 3 to 6 lb. to the gal., or q. s. to give a proper flavor, or to form a good saccharine liquid; and adding 2½ to 4 lb. of sugar to each gal. of strained liquor. One and a half lb. of raisins may be substituted for each lb. of sugar.

In the above manner are made grape wine (from the pressed cake of grapes), English grape wine, rhubarb wine (from garden rhubarb), celery wine, etc.

5. From saccharine roots and stems of plants.—Take of the bruised, rasped, or sliced vegetable, 4 to 6 lb.; boiling water, 1 gal.; infuse until cold, press out the liquid, and to each gal. add of sugar 3 to 4 lb.; cream of tartar, 1 oz.; brandy, 2 to 5%. For some roots and stems the water must not be very hot, as they are thus rendered troublesome to press.

In the above manner are made beet-root wine, parsnip wine, turnip wine, etc.

6. From flowers, spices, aromatics, etc.—These are prepared by infusing a sufficient quantity of the bruised ingredient for a few days in any simple wine (as that from sugar, honey, raisins, etc.), after the active fermentation is complete, or, at all events, a few weeks before racking them.

In the above manner are made clary wine (muscatel) (from flowers, 1 qt. to the gal.); cowslip wine (from flowers, 2 qt. to the gal.); elder flower wine (flowers of white berried elder, ¾ pt., and lemon juice, 3 fl. oz. to the gal.); ginger wine (1¼ oz. ginger to the gal.); orange wine (1 dozen sliced oranges per gal.); lemon wine (juice of 12 and rinds of 6 lemons to the gal.); spruce wine (¼ oz. of essence of spruce per gal.); juniper wine (berries, ¾ pt. per gal.); peach wine (4 or 5 sliced, and the stones broken, to the gal.); apricot wine (as peach wine, but with more fruit); quince wine (12 to the gal.); rose clove gillyflower, carnation, lavender, violet, primrose, and other flower wines (distilled water from the flowers, 1½ pt., or flowers 1 pt. to the gal.); mixed fruit wine; pine apple wine; cider wine; elder wine; birch wine (from the sap, at the end of February or beginning of March); sycamore wine (from the sap); malt wine (from strong wort); and the wines of any of the saccharine juices of ripe fruit.

7. From saccharine matter.—Take of sugar, 3 to 4 lb., cream of tartar, ½ oz.; water, 1 gal.; honey, 1 lb.; brandy, 2 to 4 per cent. A handful of grape leaves or cuttings, bruised, or 1 pt. of good malt wort, or mild ale, may be substituted for the honey. Chiefly used as the basis for other wines, as it has little flavor of its own.

In all the preceding formulæ lump sugar is intended when the wines are required very pale, and good Muscovado sugar when this is not the case. Some of the preceding wines are improved by substituting good cider, perry, or pale ale or malt wort, for the whole or a portion of the water. Good porter may also be advantageously used in this way for some of the deep colored red wines. When expense is no object, and very strong wines are wanted, the expressed juices of the ripe fruits, with the addition of 3 or 4 lb. of sugar per gal., may be substituted for the fruit in substance, and the water.

Management of Wine. — The remarks arranged under this heading are more particularly intended for the use of the dealer, the publican, and the private individual; as those which precede it are for the wine maker; matters common to each class will, however, be found in both sections of the present article.

Age.—The sparkling wines are in their prime in from eighteen to thirty months after the vintage. Thin wines, of inferior growths, should be drank within twelve or fifteen months, and be preserved in a very cool cellar. Sound, well fermented, full bodied still wines are improved by age, with reasonable limits, provided they be well preserved from the air, and stored in a cool place having a pretty uniform temperature.

Bottling.—The secret of bottling wine with success consists in the exercise of care and cleanliness. The bottles should be sound, clean and dry, and free from the least mustiness or other odor. The corks should be of the best quality, and immediately before being placed in the bottles should be compressed by means of a cork squeezer, or of one of the numerous machines made for this purpose. For superior or very delicate wines, the corks are sometimes prepared by placing them in a copper or tub, covering them with weights to keep them down, and then pouring over them boiling water holding a little pearlash in solution. In this liquid they are allowed to remain for twenty-four hours, when they are well stirred about in the liquid, drained and reimmersed for a second twenty-four hours in hot water, after which they are well washed and soaked in several successive portions of clean and warm rain water, drained, dried out of contact with dust, put into paper bags, and hung up in a dry place for use. Many wine merchants, however, disapprove of this course, and merely dip the corks in clean cold water before inserting them in the bottles. The wine should be clear and brilliant, and if it be not so, it must undergo the process of fining before being bottled. The bottles, corks and wine, being ready, a fine clear day should be preferably chosen for the bottling, and the utmost cleanliness and care should be exercised during the process. Great caution should also be observed to avoid shaking the cask, so as not to disturb the bottoms. The remaining portion that cannot be drawn off clear should be passed through the wine bag, and, when bottled, should be set apart as inferior to the rest; or the lees are collected in a cask kept for the purpose, and the clear wine resulting from their subsidence is used for filling up casks about to be fined. The coopers, to prevent breakage and loss, place each bottle, before corking it, in a small bucket or boot having a bottom made of soft cork or leather, which is strapped on the knee of the bottler. The bottlers seldom break a bottle, though they flog in the corks very hard. The bucket or boot is now very largely supplanted by Gervaise's corking machine, an apparatus which first submits the cork to great pressure, and then immediately afterward drives it firmly into the neck of the bottle, in which, owing to its subsequent expansion, it fits very closely and perfectly. When the process of bottling is complete, the bottles of wine are stored in a cool cellar on their sides, but on no account in an upright position. Sometimes they are placed in damp straw, or in sweet, dry sawdust or sand.

Alcoholizing.—Alcohol is frequently added to weak or vapid wines, to increase their strength or to promote their preservation. In Portugal, ⅛ of alcohol is commonly added to port before shipping it for England, as without this addition it generally passes into the acetous fermentation during the voyage. A little alcohol is also usually added to sherry before it leaves Spain. The addition of alcohol to wine injures its proper flavor, and hence it is chiefly made to port, sherry, and other wines, whose flavor is so strong as not to be easily injured. Even when alcohol is added to wines of the latter description, they require to be kept for some time to recover their natural flavor.

Cellaring.—A wine cellar should be dry at bottom, and either covered with good hard gravel or be paved with flags. Its gratings or windows should open toward the north, and it should be sunk sufficiently below the surface to insure an equable temperature. It should also be sufficiently removed from any public throughfare so as not to suffer vibration from the passing of carriages. Should it not be in a position to maintain a regular temperature, arrangements should be made to apply artificial heat in winter and proper ventilation in summer. The temperature should range from 55° to 65° F. For Burgundies the former temperature is the more suitable; for ports, sherries and strong wines, the latter temperature.

Decanting.—In decanting wine, care must be taken not to shake or disturb the crust when moving it about or drawing the cork, particularly of port wine. Never decant wine without a wine strainer, with some clean fine cambric in it, to prevent the crust and bits of cork going into the decanter. In decantiug port wine, do not drain it too close; as there are generally two thirds of a wineglassful of thick dregs in each bottle, which ought to be rejected. In white wine there is not much deposit; but it should nevertheless be poured off very slowly, the bottle being raised gradually.

Detartarization.—Rhenish wines, even of the

best growths, and in the finest condition, besides their tartar, contain a certain quantity of free tartaric acid, on the presence of which many of their distinctive properties depend. The excess of tartar is gradually deposited during the first years of the vatting, the sides of the vessels becoming more and more encrusted with it; but, owing to the continual addition of new wine and other causes, the liquid often gains such an excess of free tartaric acid as to acquire the faculty of redissolving the deposited tartar, which thus again dissappears after a certain period. The taste and flavor of the wine are thus exalted, but the excess of acid makes the wine less agreeable, and probably less wholesome.

Under these circumstances the best corrective is pure neutral tartrate of potash. When this salt, in concentrated solution, is added to an acid wine, the free acid combines with the neutral salt, and separates from the liquid under the form of the sparingly soluble bitartrate of potash. If to 100 parts of a wine which contains 1 part of free tartaric acid we add 1½ parts of neutral tartrate of potash, there will separate on repose at 70° to 75° F., 2 parts of crystallized tartar; and the wine will then contain only ½ part of tartar dissolved, in which there are only 0·2 part of the original free acid; 0·8 part of the original free acid having been withdrawn from the wine. This method is particularly applicable to recent must and to wines which contain little, if any, free acetic acid; when this last is present, so much acetate of potash is formed as occasionally to vitiate the taste of the liquid.

Fining.—Wine is clarified in a similar manner to beer. White wines are usually fined by isinglass. The quantity of isinglass varies with the quality and condition of the wine, and is regulated by the experience of the cellarman. Stout wines require a larger amount than thin ones. Even with stout ones it ought not to exceed ½ oz. to the hogshead. The Rhenish wines do not require more than ¼ oz., and the hocks still less. The choicest Russian isinglass only should be employed. It should be dissolved in cold water, and thinned with wine. Red wines are generally fined with the whites of eggs, in the proportion of 15 to 20 to the pipe. Sometimes, but rarely, hartshorn shavings, or pale sweet glue, is substituted for isinglass.

Flatness.—This is removed by the addition of a little new brisk wine of the same kind; or by rousing in 2 or 3 lb. of honey; or by adding 5 or 6 lb. of bruised sultana raisins and 3 or 4 qt. of good brandy, per hogshead. By this treatment the wine will usually be recovered in about a fortnight, except in very cold weather. The process may be expedited, if a tablespoonful or two of yeast be added, and the cask removed to a warmer situation.

Insipidity. See Flatness.

Maturation. — The natural maturation or ripening of wine and beer by age depends upon the slow conversion of the sugar which escaped decomposition in the gyle tun or fermenting vessel into alconol. This conversion proceeds most perfectly in vessels which entirely exclude the air, as in the case of wine in bottles; as when air is present, and the temperature sufficiently high, it is accompanied by slow acetification. This is the case with wine in casks, the porosity of the wood allowing the very gradual permeation of the air. Hence the superiority of bottled over draught wine or that which has matured in wood. Good wine, or well fermented beer, is vastly improved by age when properly preserved; but inferior liquor, or even superior liquor, when preserved in improper vessels or situations, becomes acidulous from the conversion of its alcohol into vinegar. Tartness or acidity is consequently very generally, though wrongly, regarded by the ignorant as a sign of age in liquor. The peculiar change by which fermented liquors become mature or ripe by age is termed the insensible fermentation. It is the alcoholic fermentation impeded by the presence of the already formed spirit in the liquor, and by the lowness of the temperature.

Mould or fungus is very frequently produced by keeping the wine in too warm a cellar, or in a cask not filled to the bung hole, or else in one from which the bung has been left out. As it forms mostly on weak wines, its presence may be referred to a deficiency of alcohol.

The best method for its removal is either burning sulphur in a partially filled cask, or drawing off the wine into a fresh cask, in which sulphur has been previously burnt. It is advisable that wines so treated should be drunk as soon as possible.

Wine sometimes has an unpleasant musty taste, which it has acquired from being put into a dirty cask, or into one that has been unused for some time. This bad flavor, which is known as caskiness, may generally be removed by vigorously agitating the wine for some time with a little sweet, olive, or almond oil. The cause of the bad taste is the presence of an essential oil, which the fixed oil combines with and carries to the surface, whence it may be skimmed off, or the wine lying under it may be drawn off. A little coarsely powdered and freshly burnt charcoal, or some slices of bread toasted until they become black, or a little bruised mustard seed, sometimes effects the removal of the objectionable taste.

Ripening.—To promote the maturation or ripening of wine, various plans are adopted by the growers and dealers. One of the safest ways of hastening this, especially for strong wines, is not to rack them until they have stood 15 or 18 months upon the lees; or, whether crude or racked, keeping them at a temperature ranging between 55° and 65° F., in a cellar free from draughts and not too dry. Full or heavy sherries or ports, when bottled and treated in this manner, ripen very quickly in a temperate situation.

Racking.—Racking should be performed in cool weather, and preferably early in the spring. A clean siphon, well managed, answers better for this purpose than a cock or faucet. The bottoms, or thick portion, may be strained through a wine bag, and added to some other inferior wine.

Ropiness, Viscidity; *Graisse.* — This arises from the wine containing too little tannin or astringent matter to precipitate the gluten, albumen, or other azotized substance, occasioning the malady. Such wine cannot be clarified in the ordinary way, because it is incapable of causing the coagulation or precipitation of the finings. The remedy is to supply the principle in which it is deficient. M. François, of Nantes, prescribes for this purpose the bruised berries of the mountain ash in the proportion of 1 lb. to the barrel. A little catechu, kino, or, better still, rhatany, or the bruised footstalks of the grape, may also be conveniently and advantageously used in the same way. For pale white wines, which are the ones chiefly attacked by the malady, nothing equals a little pure tannin or tannic acid dissolved in proof spirit.

Second Fermentation; *La-pousse.* — Inordinate fermentation, either primary or secondary, in wine or any other fermented liquid, may be readily checked by sulphuration, or by the addition of sulphur, mustard seed, or sulphite of lime. The latter must, however, be used with discretion.

Sparkling, Creaming and Briskness.—These properties are conveyed to wine by racking it into closed vessels before the fermentation is complete, and while there still remains a considerable portion of undecomposed sugar. Wine which has lost its briskness may be restored by adding to each bottle a few grains of white lump sugar or sugar candy. The bottles are afterward inverted, by which means any sediment that forms falls into the necks, when the

corks are partially withdrawn, and the sediment is immediately expelled by the elastic force of the compressed carbonic acid. If the wine remains muddy, a little solution of sugar and finings are added, and the bottles are again placed in a vertical position, and, after two or three months, the sediment is discharged as before.

Ages of Different Wines when at Their Prime. See also the Management of Wine above.—The age named below for each wine will be found to be that at which it possesses its fullest flavor and when it will be best to drink it.

Port	20 years.
Madeira	10 years.
Sherry	10 years.
Red Madeira	6 years.
Madeira-malmsey	5 years.
Callavella	4 years.
Malaga	3 years.
Muscatel	3 years.
Red hermitage	20 years.
White hermitage	20 years.
Roussillon	20 years.
Rivesaltes	20 years.
Banyuls	20 years.
Collioure	15 years.
Salces	10 years.
La Palme	10 years.
Sigean	8 years.
Carcassone	8 years.
Beziers	8 years.
Lunel	8 years.
Champagne	6 years.
Montpellier	5 years.
Frontignan	5 years.

Acid Taste of Wines, to Remove.—Neutralize the excess of acid by powdered chalk.

Alcoholizing Wine. See *Management of Wine*, p. 614.

Apple Wine.—1. Finest cider, 60 gal.; brown sugar, ½ cwt.; bitter almonds, ¼ oz. Mix the cider and sugar, and ferment; then rack the mixture, and put into the cask the almonds, with 16 or 18 cloves, and 3 or 4 pieces of bruised ginger. When fine, bottle it and keep it in a cool place. The addition of a small piece of lump sugar to each bottle will make the cork fly out, as from champagne; but do not add this unless you have a very cold cellar to keep it in.

2. Forty lb. sugar, 15 gal. cider. The cider must be pure and made only from really ripe, sound apples (this is important). If the wine is to be quite sweet, add another 10 lb. of sugar, and put all into the cider, letting it stand till dissolved. Put the liquor into a cask but leave it unfilled to the extent of 2 gal. Put the cask into a cool position, with the bung out for forty-eight hours. After this bung it up, but let there be a small vent somewhere—in the bung would do—until the fermentation is over. Then bung up securely, and the wine will be ready for consumption in twelve months. There is no racking required in the manufacture of this wine. To remain in the cask twelve months. Make this in January or February.

Apricot Wine.—Twelve lb. ripe apricots, 6 oz. loaf sugar to each qt. liquor. Wipe the apricots, cut them in pieces and let them boil in 2 gal. water. After boiling, let them simmer till the liquor is strongly impregnated with the flavor of the fruit. Strain through a hair sieve, and put 6 oz. lump sugar to every qt. liquor. Boil again, skim very carefully, and as soon as no more scum appears, put it into an earthen pan. Bottle next day if it is quite clear, and put 1 lump of sugar into each bottle. It should be fine wine in six months. Two hours to boil. Make this in August or September.

Balm Wine.—1. Into 8 gal. of water put 20 lb. of moist sugar; boil for two hours, skimming thoroughly; then pour into a tub to cool; place 2½ lb. of balm tops, bruised, into a barrel with a little new yeast; when the liquor is cold pour it on the balm; stir it well together, and let it stand twenty-four hours, stirring it frequently; then close it up tightly at first, and more securely after fermentation has quite ceased; when it has stood two months, bottle off, putting a lump of sugar into each bottle; cork down well and keep in bottle at least a year.

2. Put a peck of balm leaves into an open tub; pour on them 4 gal. of boiling water; cover up the tub and let them infuse for twelve or fourteen hours; strain the liquor at the end of that time through a hair sieve, and to every gallon add 2 lb. of good moist sugar, stirring well for twenty minutes; take the whites of 4 eggs, whisk them over the fire in a saucepan; remove it from the fire as the scum rises, and skim the latter off; then add it to the liquor; boil the whole for three quarters of an hour, letting it work three or four days before you tun it; bung down, and when fine, bottle it off; in six or eight months it will be fit to drink.

Bilberry Wine.—The fruit should be picked on a very dry day, when it is quite ripe. The leaves and stalks must be carefully removed from the berries and the fruit, then weighed. To 4 gal. of fruit allow either 6 gal. of cold water or else 3 gal. of water and 3 gal. of cider, and 10 lb. of good moist sugar; let all these ingredients ferment in an open tub until working is over; then add ½ gal. of brandy, a handful of lavender and rosemary leaves mixed, 2 oz of powdered ginger, and 2 oz. of powdered tartar; let the liquor rest after this addition for forty-eight hours, then strain very carefully through a hair sieve into a perfectly clean cask, laying the bung lightly on the bung hole until the working is quite over; and no hissing sound is heard; then close down quite tightly, and bottle off at the end of three months; keep six or eight months in bottle before use.

Blackberry Wine.—1. To 1 gal. of mashed blackberries add a quart of boiling water; let it stand for twenty-four hours, or nearly as long, then strain through a coarse bag or towel, adding 3 qt. of water and 2 lb. of brown sugar to each gallon of the mixture, making equal parts of water and juice; mix well, then put in demijohns, stone jugs or a tight, clean keg; close partially and put in a cool place; if in a warm place or left entirely open it will sour; if stopped entirely tight it will burst the vessel—but cork left loosely in; let it stand until fermentation ceases, which will be about October; then bottle, and this makes excellent wine and a fine medicinal drink for summer affections.

2. The following is said to be an excellent receipt for the manufacture of superior wine from blackberries: Measure your blackberries, and bruise them; to every gallon add 1 qt. of boiling water; let the mixture stand twenty-four hours, stirring occasionally; then strain off the liquor into a cask; to every gallon add 2 lb. of sugar; cork tight, and let stand about one year, and you will have wine fit for use, without any further straining or boiling. This wine is very highly recommended for household use.

Bottling of Wine. See *Management of Wine* on page 614.

Catawba Champagne.—Twenty gal. Catawba, 1 qt. Cognac brandy, and 2 gal. champagne syrup.

Cellaring Wine. See *Management of Wines*, page 614. Also *Laying Down Wines*, below.

Champagne, Imitation.—

1. Prepared cider	25	gal.
Citric acid	5	drm.
Simple syrup	1¼	pt.
Water	1¼	gal.
Spirits (10 under proof)	2½	gal.
Tartaric acid	1¼	oz.

Let this stand twelve days, then fine and bottle, if it is frothing and sparkling; if not, add

more acid; and fine again. Add to each bottle about 2 teaspoonsful of syrup, made by dissolving ½ lb. rock candy in 1 pt. white wine.

2. Cider, pale, 1 hogshead; spirit, 3 gal.; honey or sugar, 20 lb. Mix and allow to remain two weeks; then fine with skimmed milk, ½ gal. This will be very pale.

3. Cheap Champagne.—

Bordeaux	10	gal.
Bodenheimer or Hockheimer	10	gal.
Water	10	gal.
French spirit	1	gal.
Syrup	3	gal.

Made of 18 lb. sugar and 6 qt. water.

4. Champagne, Gooseberry. — Ferment together 5 gal. white gooseberries, mashed, with 4½ gal. water. Add 6 lb. sugar, 4½ lb. honey, 1 oz. finely powdered white tartar, 1 oz. dry orange and lemon peel, and ½ gal. white brandy. This will produce 9 gal. Before the brandy is added, the mixture must be strained and put into a cask.

5. *Champagne Liqueur.*—

Fine loaf sugar	13	lb.
Water	1½	gal.

Boil together. While boiling, add by degrees 3 qt. alcohol, 90%, filter. Add to the following compound:

6. Louis Röederer.—Mix the champagne liqueur with 11¼ gal. white wine; 1½ bottle cognac; 6 drops sulphuric ether, dissolved in the cognac.

7. Champagne, Syrup for.—Dissolve 12 lb. white sugar in 1 gal. water, and add the whites of 2 eggs. Heat until it candies. Strain through flannel.

Cherry Wine.—Take of cold soft water, 10 gal.; cherries, 10 gal.; ferment. Mix raw sugar, 30 lb.; red tartar, in fine powder, 3 oz.; add brandy, 2 or 3 qt. This will make 18 gals. Two days after the cherries have been in the vat, we should take out about 3 qt. of the cherry stones, break them and the kernels, and return them into the vat again.

Black Cherry Wine.—24 lb. of small black cherries, 2 lb. of sugar to each gal. of liquor.

Bruise the cherries, but leave the stones whole, stir well, and let the mixtnre stand 24 hours, then strain through a sieve, add the sugar, mix again, and stand another 24 hours. Pour away the clear liquor into a cask, and when fermentation has ceased, bung it closely. Bottle in 6 months' time. It will keep from 12 to 18 months.

Time.—To remain in the cask six months. Make this in July or August.

Claret.—

1. Prepared cider	30	gal.
Good port wine	6	gal.
Water	1½	gal.
Tartar	1½	lb.
Syrup	1½	pt.
Citric acid	2¼	drm.
Raisins	3	lb.

Color if desired with red sanders or red beet juice. Let it stand 10 to 12 days, rack.

2. Good cider and port wine, equal parts.

3. To each gallon of the last add cream of tartar (genuine) 3 drm., and the juice of one lemon.

4. To either of the preceding add French brandy, 2 oz.

5. Instead of port, use red cape or British port.

If the first three of the above are well mixed and fined down, and not bottled for a month or five weeks, they can scarcely be distinguished from good Bordeaux. A mixture of 4 parts of raisin wine with 1 part each of raspberry, and barberry or damson wine, also forms an excellent factitious claret.

Coca Wine.—This is a French preparation. Its strength is about 1 in 30, and the dose a wineglassful. Coca wine is, roughly speaking, about one-sixth of the strength of the official liquid extract (*Extractum Cocæ Liquidum* B. P., or *Extractum Erythroxyli Fluidum* U. S.). To obtain the liquid extract, coca leaves are exhausted by percolation (which differs from either decoction or infusion) with proof spirit. At the termination of the process, the strength should be adjusted so that 1 oz. = 1 of leaves. The process of percolation is as follows: The leaves are placed in a vessel very like an elongated funnel, closed at its base by a porous diaphragm. This funnel fits into a receiver, and a small tube passes up its outer side and enters it near the top, forming a means of communication between the two. Spirit is now poured on the leaves, and the percolator closed. As the percolate filters slowly through into the reservoir, the displaced air passes up the tube, and so maintains an equilibrium in both vessels. The virtue of the coca leaves lies principally in the presence of the alkaloid cocaine. This, in the dried leaves, is supposed to exist as an inert salt, similar to many of the cinchona alkaloids in bark.

Coloring Matters Used to Color Wine. — Various matters are largely employed to artificially heighten the colors of wines. The different spurious coloring matters can be detected by using a solution of lead acetate, and the precipitates formed give a good test by which the various colors can be determined.

1. Malva flowers or hollyhock produce, when steeped in spirits for 24 hours, or even when boiled with water, a very beautiful purple.

2. The pokeberry (the dark berries from the plant growing all over the United States) has a very dark red color.

3. Whortleberry, huckleberry, elderberry, blackberry and mulberry.

4. Cochineal gives a fine red color by boiling finely ground cochineal with cream of tartar.

5. Brazil wood, sanders wood and logwood. These woods are boiled in water, and the decoctions yield shades of color from red to blue.

6. Orchil produces a beautiful purple.

7. Red beets and carrots produce likewise a good color.

8. Indigo solution, neutralized by potash, produces a fine blue.

9. Annatto and extract of safflower produce a beautiful yellow.

10. Red cabbage produces a beautiful bluish red.

11. Turmeric is the most common color for yellow, as the spirit extracts all color immediately; as also quercitron bark.

12. Garacine (extract of madder) produces various shades of red.

13. Tincture of saffron (Spanish saffron) for yellow.

14. Blue vitriol, or solution of indigo, produces blue.

15. Burnt sugar produces a fine and permanent brown color for wines. It is best to boil down common sugar or loaf sugar nearly to dryness. It is then dissolved in hot water sufficient to make the consistency of syrup; and for the purpose of neutralizing it and making it a more permanent color, add to each gal. of sugar color, about 1 oz. liquid *ammonia*.

16. Green color for absinthe is prepared from a solution of extract of indigo and turmeric, dissolved in spirits.

17. Violet is obtained by a solution of extract of logwood and alum.

18. Alkanet root produces a fine blue red by macerating in alcohol.

19. Barwood acquires a dark wine red color by digesting in alcohol.

20. Brazil wood, by being macerated in alcohol, or by boiling for half hour, produces a deep red.

Spurious Coloring Matter.—

The following coloring matters give, with lead acetate, the following precipitates:

Pure red wine	gives	bluish gray.
Red poppy	"	dirty gray.
Elderberry	"	dirty green.
Bilberry	"	grayish green.
Privetberry	"	green.
Dwarf elder	"	bluish gray to violet in the fresh berries and fine green in the fermented extract.
Mallow flower	"	dark green.
Logwood	"	feeble dark blue.
Brazil wood	"	wine red.

The following colors, when present, give the following precipitates with alum and ammonium carbonate;

Pure red wine	gives	dirty green.
Red poppy	"	slate gray.
Elderberry	"	bluish gray.
Bilberry	"	bright violet
Privetberry	"	bright green.
Dwarf elderberry	"	bright violet.
Mallow flower	"	bluish violet.
Logwood	"	dark violet.
Brazil wood	"	carmine red.

Cranberries can be made into wine in the same way as bilberries. In America the cranberry is largely cultivated, and forms a considerable article of commerce, a quantity of the fruit being exported. In the northern parts of Russia it isalso very abundant.

Cowslip Wine.—To every gal. of water allow 3 lb. of lump sugar, the rind of 2 lemons, the juice of one, the rind and juice of 1 Seville orange, 1 gal. of cowslip pips. To every 4½ gal. of wine allow 1 bottle of brandy. Boil the sugar and water together for ½ hour, carefully removing all the scum as it rises. Pour this boiling liquor on the orange and lemon rinds, and the juice, which should be strained; when milk warm, add the cowslip pips or flowers, picked from the stalks and seeds; and to 9 gal. of wine 3 tablespoonfuls of good fresh brewers' yeast. Let it ferment three or four days, then put all together in a cask with the brandy; and let it remain for two months, when bottle it off for use. To be boiled ½ hour; to ferment three or four days; to remain in the cask two months. Make this in April or May.

Currant Wine.—Squeeze the currants through a coarse bag; have equal parts of water and juice, or ⅛ water, as taste may direct, and add 3 lb. of loaf sugar to each gal. of the mixture; mix well and bottle in stone jugs or demijohns; treat same way as blackberry wine—partially corked and keep in a cool place. Some keep a bottle of the mixture to fill up the vessels as they effervesce, but it is not always necessary. Bottle in October, when fermentation ceases; this makes a beautiful and delicious wine, and improves with age.

Red Currant Wine (with Raspberries.)—Ten gal. of red currant juice, 1 pt. of raspberry juice, 20 gal. of water, 18 lb. of finely sifted loaf sugar. Put the ingredients together and let them stand until the sugar is dissolved,then put the liquor into a cask and bung lightly for the air to aid in the fermentation. Let it cease fermenting, then bung tightly. Bottle in a year's time, using sound corks and sealing them. It will be in excellent condition in three months.

Currie Wine.—Currie powder, 5 oz.; white wine, 1 gal. Digest for one week and strain.

Cyprus.—Muscatel (very old), 25 liters; alcohol, 85%, 5 liters; white wine (dry and alcoholic), 64 liters; infusion of walnuts, 1 liter; white sugar, 2 kilos.; water, 1 liter. Mix the different wines together; add the alcohol and the infusion of walnuts; dissolve the sugar in the water, and boil till the solution becomes of a golden color; add it to the mixture with a little of the infusion of cloves.

2. British Cyprus.—From the juice of white elderberries, 1 qt., and Lisbon sugar, 4 lb., to water, 1 gal., together with ½ drm. each of bruised ginger and cloves. When racked add raisins and brandy, of each 2 oz.

Damson Wine.—

1. Water	12	gal.
Damsons (bruised)	8	gal.
Raw sugar	30	lb.

Ferment, then add—

Red tartar (dissolved)	6	oz.
Cloves (bruised)	¼	oz.

Let it stand until fine, then bottle.

2. Crush 20 lb. ripe damson plums; boil in 3 gal. water; press out the juice; add 6 lb. sugar; put in a barrel and let it ferment; then add after two weeks a little good brandy; bottle.

3. One gal. of boiling water to every 8 lb. of bruised fruit, 2½ lb. of sugar to each gal. of juice.

Well bruise the fruit and pour the boiling water on it; let it stand forty-eight hours. Then strain the mixture into a cask and put in the sugar. When fermentation ceases fill up the cask and bung closely. Bottle in ten months' time. It will be fit for use in a year, but improves with keeping. Time required, about two years.

Detannation of Wines.—The Formulary recommends the following method for removing the tannin or astringent matter from sherry wine:

Sherry	7	pt.
White of egg	1	fl. oz.
Alcohol	1	pt.

Beat the white of egg to a froth and mix it with wine; heat to about 170° F., or until the albumen is coagulated. Then cool, add the alcohol, and after standing a few hours, filter clear through paper.

This wine is a much better menstruum and preservative medium for organic substances than sherry itself.

Detartarization of Wine. See *Management of Wine*, on page 614.

Elder Wine.—

Alcohol, 90%	12½ gal.
Water	12½ gal.
Elderberries (juice of)	6¼ gal.
Loaf sugar	18¾ lb.
Port wine	2¼ gal.
Orange flower water	⅝ pt.

Allow it to stand one week; draw off.

Elderberry Wine.—1. Gather the berries when quite ripe, on a dry day; pick them off the stems, and bruise them with your hands. Strain the juice; let the liquor rest in glazed earthenware pans for twelve hours to settle. Allow to every pint of juice a 1½ pt. of water, and to every gallon of the mixed water and juice 3 lb. of good moist sugar. Put it over the fire in a large saucepan, and when it is ready to boil, clarify it with the whites of four eggs. Let it boil for an hour, and, when nearly cold, put in some yeast to work it; pour it into the cask, reserving some of the liquor to fill up the cask with, as it sinks with working. If you have about 10 gal. or so, it should be fit to bottle off in two months' time after it has been closed down. Keep at least a year in bottle.

2. Gather the berries when quite ripe, and in dry weather. Pick them clean; put them into a copper with ½ gal. of water, and keep up a slow fire until the berries sink, then strain the juice through a hair sieve, and to every gallon of it allow 3 gal. of soft water, and to every gallon of the mixed liquor 3 lb. of good moist sugar. Put back into the copper, and boil for an hour, skimming thoroughly; draw off into a tube, and, when it is about 70°, put a toast spread with yeast into it, and let it work for forty-eight hours, or longer if necessary; pour it or draw it off if you have a tap in your tub,

as should be the case, into the cask which is to hold it, and if you have 18 gal. of liquor, add 1 oz. of cloves, 2 oz. of allspice, 3 oz. of Jamaica ginger, and 1 oz. of sweet almonds, all bruised. Bung very slightly until fermentation is quite over; then close down tightly and tap in three months.

3. Old recipe: Put the ripe picked over berries into an earthen pot; put this into a copper with sufficient water to come up about two-thirds of the height of the pot, which is about as far as the berries should reach inside; be careful that no water touches them. Make a gentle fire, and keep the pot in the water till it is quite hot; then take it out. Pour the berries into a coarse cloth, strain the juice, and put it into a large saucepan; to every quart of juice allow a pound of good moist sugar; let it boil, and skim well. It should boil until rather thick, then pour it into a jar. Put 60 lb. of raisins into a cask, and fill it up with water; let it stand for a fortnight; stir it well every day; then pour off the liquor into a clean cask that just holds it. It should stand until it has done hissing; then bung it down close, and stand until fine. To every gallon of this liquor, allow half a pint of the elder sirup; mix well, and when it has fined down, rack off into another cask; bottle off after three months.

4. Chop a quantity of Malaga raisins quite fine; allow 1 qt. of water to every lb. of raisins, and put raisins and water into an open tub; cover over with a double cloth, and let it stand for nine days, stirring up each day. Then draw off the liquor as long as it will run, and press the raisins to get out the remainder of the juice; mix all together in a barrel. To every gal. of liquor allow 1 pt. of the juice of elderberries, prepared simply by mashing the berries with the hands, and straining off the juice. Stop down close, and stand for six weeks, then draw off the fine liquor, and to every gal. add ½ lb. of moist sugar. Stand again until quite fine, and then bottle off. Keep in a cool cellar for use.

5. Take 30 lb. of Malaga raisins, add 8 gal. of water to them, and allow to steep for twelve days; draw off the liquor, and put it into a copper with 2 gal. of elderberry juice; boil for ten minutes, removing all scum as it rises; then add 7 lb. of moist sugar, ½ oz. of allspice, ½ oz. of cloves, and 2 oz. of Jamaica ginger, all well bruised; boil again for an hour, skimming thoroughly; draw it off and float some toast covered with yeast in it; leave it to work for two or three days, then pour into a clean cask, and, when all fermentation is over, bung down tightly. If made the end of August or in September, this wine would be ready to tap about Christmas, and should be bottled in January or March.

6. Allow 3 qt. of elderberries, which are quite ripe and carefully picked over, to every gal. of water; boil, skimming well, until the berries break, then strain the liquor, and to every gal. allow 3 lb. of moist sugar, and to every 4 gal. add 2 oz. of bruised ginger, 2 oz. of cloves, and 2 oz. allspice; boil for an hour; work with yeast when nearly cold; cask it the third day, and when all working is over, bung down.

7. To every gal. of berries allow a gal. of water; steep in a tub for four days, bruising well each day. Squeeze the pulp, and strain off the juice. To every gal. add 3 lb. of brown sugar, and spices in the same proportion as in the above recipe; tie the spice in a muslin bag; boil all the ingredients for an hour; work with yeast when nearly cold; then pour into a well cleaned cask, and bung down when the fermenting operation has quite ceased. Bottle off in two or three months. Into every bottle put a lump of white sugar and a little brandy.

8. To 1 gal. of berries add 3 qt. of water; bruise in a tub, and stand for three days. To every qt. of liquor allow 1 lb. of moist sugar, 1 oz. of ginger, and 1 oz. of cloves, both bruised (the spice should be put into muslin bags); put all together into a perfectly clean vessel, and boil for one hour; then pour into an earthenware pan; when cool enough to dip in the finger, put in a tablespoonful of brewers' yeast; let it work three days, then skim and put in a small cask just large enough to hold the amount. Keep out the air for three weeks, but do not bung down close until that period has elapsed. Tap in two months to test it; if fine, bottle off.

Elder flower wine is made from the flowers in this manner: 1. Gather the flowers on a dry day; remove all stalks, and to every qt. of flowers allow 1 gal. of water and 3 lb. of loaf sugar; boil the sugar and water for a quarter of an hour; then pour it on the flowers, and let it work for three days; then strain the wine carefully through a hair sieve, and put it into a cask. To every 5 gal. of wine add ½ oz. of isinglass, dissolved in cider, and 3 eggs (whites only) beaten up; close up the cask, and stand six months before bottling off.

2. Boil 18 lb. of powdered loaf sugar in 6 gal. of spring water; beat up the whites of 2 eggs, and add; skim very thoroughly, and put in a ¼ of a peck of elder flowers, picked from their stems; take off the fire, and stir until cool, then add 4 tablespoonfuls of yeast and 6 spoonfuls of lemon juice, strained and free from pips; mix well with the liquor by stirring twice daily for four days. Stone 6 lb. of Malaga raisins, and put them into a well cleaned out cask; pour the wine upon them. Stop up the cask closely, and keep it in a rather warm place. If made in July or August, bottle off in February or March. This wine, when well made, very much resembles Frontignac.

Fig Wine.—Figs are largely employed, especially in Algeria, for the production of fictitious wine. For this purpose figs from Asia Minor are preferred on account of their relative cheapness aad richness in sugar. When the fruit is treated with a suitable quantity of tepid water, acidified with tartaric acid, fermentation rapidly commences, resulting in the production of a vinous liquid of about 8° alcoholic strength, and so inexpensive that it defies all competion of genuine grape wine, Algerian or otherwise. Fig wine cannot be distinguished either by taste or the ordinary methods of analysis from genuine grape wine, especially when it is mixed with a proportion of the latter. The detection of fig wine, however, is rendered comparatively easy by the fact that it contains mannitol. In order to separate the mannitol, 100 c. c. of fig wine are evaporated to a syrup, which is allowed to stand in a cool place for twenty-four hours. At the end of this time the residue will have solidified, well defined groups of crystals being formed. The crystals are washed with cold alcohol of 85% strength in order to remove impurities. The residue is mixed with animal charcoal and extracted with boiling 85% alcohol and filtered. The alcoholic solution yields on evaporation a crystalline mass of mannitol, which may be recognized by its physical and chemical properties. Certain white wines from the Gironde district, as well as raisin and some other wines, contain mannitol, but only to the extent of a few decigrammes per lit.; while fig wine contains from 6 to 8 grm. per lit. By a determination of the mannitol it is possible to detect an adulteration of normal Algerian wine with one half or even one fourth of fig wine.

To Fine Wines.—There are various modes of fining wine; eggs, isinglass, gelatine and gum arabic are all used for the purpose. Whichever of these articles is used, the process is always the same. Supposing eggs (the cheapest) to be used: Draw a gal. or so of the wine and mix 1 qt. of it with the whites of 4 eggs, by stirring it with a whisk; afterward, when thoroughly mixed, pour it back into the cask through the bunghole, and stir up the whole cask in a rotary direction with a clean split stick inserted through the bunghole. Having

stirred it sufficiently, pour in the remainder of the wine drawn off, until the cask is full; then stir again, skimming off the bubbles that rise to the surface. When thoroughly mixed by stirring, close the bunghole, and leave it to stand for three or four days. This quantity of clarified wine will fine 13 doz. of port or sherry. The other clearing ingredients are applied in the same manner, the material being cut into small pieces, and dissolved in the qt. of wine, and the cask stirred in the same manner.

To Lay Down Wine. – Having carefully counted the bottles, they are stored away in their respective bins, a layer of sand or sawdust being placed under the first tier and another over it; a second tier is laid over this, protected by a lath, the head of the second being laid to the bottom of the first; over this another bed of sawdust is laid, not too thick, then another lath; and so on till the bin is filled. Wine so laid in will be ready for use according to its quality and age. Port wine, old in the wood, will be ready to drink in five or six months; but if it is a fruity wine, it will improve every year. Sherry, if of good quality, will be fit to drink as soon as the sickness (as its first condition after bottling is called) ceases, and will also improve; but the cellar must be kept at a perfectly steady temperature, neither too hot nor too cold, but about 55° or 60°, and absolutely free from draughts of cold air.

To Fine White Wine.—To fine 30 gal. white wine the whites of 3 eggs, will be required with the addition of ½ an egg shell reduced to powder, and a tablespoonful of salt. Beat up all together with a little of the wine and then pour gradually into the wine, stirring constantly.

To Fine Red Wines.—The operation is carried on in the same manner. To lighten up a wine add 6 eggs and a handful of salt, use the whites, yelks, and shells.

Flatness of Wine. See *Management of Wine*, page 615.

Ginger Wine.—1. This is an excellent stomachic, and is very popular in England as a cheap substitute for a grape wine:

Sugar	12 lb.
Water	3½ gal.
Ginger	4 oz.

Boil them together for half an hour; when cooled to 75 degrees, add the rinds of 6 lemons and some good yeast; let it ferment for ten or fourteen days, then add 1 pint of brandy and bottle if for use.

2. To 9 gal. of water allow 27 lb. of loaf sugar, 9 lemons, 12 oz. of bruised ginger, 3 tablespoonfuls of yeast, 2 lb. of raisins stoned and chopped, 1 pt. of brandy.

Boil together for one hour in a copper (let it previously be well scoured and beautifully clean) the water, sugar, lemon rinds and bruised ginger. Remove every particle of scum as it rises, and when the liquor is sufficiently boiled, put it into a large tub or pan, as it must not remain in the copper. When nearly cold, add the yeast, which must be thick and very fresh, and the next day, put all in a dry cask with the strained lemon juice and chopped raisins. Stir the wine every day for a fortnight; then add the brandy, stop the cast down by degrees, and in a few weeks it will be fit to bottle. Sufficient to make 9 gal. of wine. The best time for making this wine is either in March or September.

Gooseberry Wine, Effervescing.—To every gallon of water allow 6 lb. of green gooseberries, 3 lb. lump sugar.

This wine should be prepared from unripe gooseberries, in order to avoid the flavor which the fruit would give to the wine when in a mature state. Its briskness depends more upon the time of bottling than upon the unripe state of the fruit, for effervescing wine can be made from fruit that is ripe as well as that which is unripe. The fruit should be selected when it has nearly attained its full growth, and consequently before it shows any tendency to ripen. Any bruised or decayed berries and those that are very small should be rejected. The blossom and stalk ends should be removed, and the fruit well bruised in a tub or pan, in such quantities as to insure each berry being broken without crushing the seeds. Pour the water (which should be warm) on the fruit, squeeze and stir it with the hand until all the pulp is removed from the skin and seeds, and cover the whole closely for twenty-four hours; after which strain it through a coarse bag, and press it with as much force as can be conveniently applied, to extract the whole of the juice and liquor the fruit may contain. To every 40 or 50 lb. of fruit 1 gal. more of hot water may be passed through the marc, or husks, in order to obtain any soluble matter that may remain, and be again pressed. The juice should be put in a tub or pan of sufficient size to contain all of it, and the sugar added to it. Let it be well stirred until the sugar is dissolved; and place the pan in a warm situation; keep it closely covered, and let it ferment for a day or two. It must then be drawn off into clean casks, placed a little on one side for the scum that rises to be thrown out, and the casks kept filled with the remaining must that should be reserved for that purpose. When the active fermentation has ceased, the casks should be plugged upright, again filled, if necessary, the bungs be put in loosely, and after a few days, when the fermentation is a little more languid (which may be known by the hissing noise ceasing), the bungs should be driven in tight, and a spile hole made, to give vent if necessary. About November or December, on a clear, fine day, the wine should be racked from its lees into clean casks, which may be rinsed with brandy. After a month, it should be examined to see if it is sufficiently clear for bottling; if not, it must be fined with isinglass, which may be dissolved in some of the wine; 1 oz. will be sufficient for 9 gal. In March or April, or when the gooseberry bushes begin to blossom, the wine must be bottled, in order to insure its being effervescing. Make this the end of May or the beginning of June, before the berries ripen.

Grape Wine.—1. Ripe grapes.—Mash sound, ripe grapes well with your hands in an earthen pan, or if not with your hands with a perfectly tasteless stick of wood. Do not crush the seeds; strain the liquor into a cask, gently squeeze the pulp, pouring the remainder of the juice into the cask (strained). Let it stand aside for a fortnight, then draw it off into another cask, covering up the bunghole with a piece of slate till all fermentation has ceased. Bottle in six months, cork and seal, and it will be drinkable in twelve months' time.

2. Grape Wine.—Ten lb. fresh grapes are put into a large jar or crock, 3 qt. boiling water poured over them, and when the water is cool enough to permit of it, squeeze the grapes well with the hand. After allowing the jar to remain 3 or 4 days covered with a cloth, press out the grapes, then add 5 lb. sugar. Allow it to remain for one week, skim and strain carefully, then bottle, corking loosely. After the fermentation is completed, strain and seal tightly.

3. Put 20 lb. of ripe grapes into a stone jar and pour on 6 qt. boiling water; when cooled sufficiently squeeze by hand. Cover jar with cloth, let stand for three days, then press out the juice; add 10 lb. crushed sugar. After standing a week, scum, strain and bottle, corking loosely. When fermentation is complete strain again and bottle, corking tightly. Lay on side in cool place.

British Hock, British Red Hock.—From cream of tartar, 1¼ oz.; tartaric acid, ½ oz. (both in very fine powder); juices of the purple plum, ripe apples, and red beet, of each (warmed), 5 pt.; lemon juice, 1 pt.; with white sugar, 2½ lb. per gal.

Honey Wine.—

Honey	20	lb.
Cider	12	gal.

Ferment, then add—

Rum	½	gal.
Brandy	½	gal.
Red or white tartar (dissolved)	6	oz.
Bitter almonds	¼	oz.
Cloves	¼	oz.

This is also called mead wine.

Kola Wine.—

Kola nuts in coarse powder	1	oz.
Sherry wine	30	oz.

Macerate for eight days and filter.

This wine may also be made with roasted kola nuts, which give a better tasting preparation and it is none the worse for the addition of a little sugar.—*Dieterich in Phar. Central.*

Madeira Wine.—1. To 10 gal. prepared cider add 1 gal. Madeira wine; 3 qt. pure proof spirits; 1 qt. brandy; ¾ to 1 oz. tartaric acid; ¼ drm. oil bitter almonds cut in ½ pt. alcohol; 1½ lb. loaf sugar. Allow it to stand for two weeks; rack, fine and repeat if necessary.

2. Pale malt, ground, 4 bushels; boiling water, 44 gal.; infuse, strain off this while warm; take 24 gal. and add sugar candy, 14 lb., and cream of tartar, 3 oz.; when dissolved add yeast 2 lb.; ferment, keep skimming off the yeast and when the fermentation is nearly finished add raisin wine, 2½ gal.; brandy and sherry wine of each 2 gal.; rum, 1 qt.; bung it down for six or nine months. A second infusion of the malt may be made for beer.

3.

Purified honey	15	oz.
Hop tops	¾	oz.
Alcohol, 90%	19½	oz.
French wine	4½	qt.

Add ¾ oz. tincture burned sugar. Filter.

Mead or Honey Wine.—Take 10 gal. of water, 2 gal. of strained honey, with 2 or 3 oz. of white Jamaica ginger root, bruised, and 2 lemons cut in slices. Mix all together and boil for half an hour, carefully skimming all the time. Five minutes after the boiling commences add 2 oz. of hops. When partially cold put it into a cask to work off. In about three weeks after working it will be fit to bottle. This is a wholesome and pleasant beverage, particularly grateful in summer when drunk mixed with water.

British Malmsey.—From sliced or grated parsnips, 4 lbs.; boiling water, 1 gal.; when cold press out the liquid, and to each gal. add of cream of tartar, ½ oz., and good Muscovado sugar, 3 lb.; ferment, rack and add of brandy, 3% to 5%. Good Malaga raisins may be substituted for the sugar.

Maturation of Wine. See *Management of Wine*, page 615.

Medicated Wines.—Dieterich, in a late issue of his *Pharmaceutische Manual*, gives a number of formulæ for the preparation of medicated wines. Few, if any, of these can be regarded as tipples, but all are peculiar for the fact that the wine from which they are made is detannated. We give a selection of the more important formulæ for articles which should be salable if put up in attractive form and brought before customers in a nice way.

Cascara Sagrada Wine.—

White gelatine, in strips	15	grn.
Distilled water	2½	drm.

Dissolve by the aid of heat, and add to—

Sherry wine	28	oz.

Shake well, set aside for some time, then add—

Tasteless fluid extract of cascara sagrada	1½	oz.
Sugar	1½	oz.

Set aside in a cool place for eight days, and filter.

A similar wine, not free from the bitter principle of the bark, may be made by macerating 1½ oz. of cascara sagrada and 1½ oz. of sugar in 30 oz. of sherry, for eight days, and filtering. A *Rhamnus frangula* wine can be made in the same way.

Cinchona Wine.—

White gelatine	15	grn.
Distilled water	2½	drm.
Sherry wine	18	oz.

Detannate in the manner directed above; then add—

Simple syrup	6	oz.
Tincture of cinchona	6	oz.

After eight days, filter.

May also be made with red wine, or direct from the bark, the quantities being—

Gelatine	15	grn.
Distilled water	2½	drm.
Sherry wine	30	oz.
Cinchona bark, in coarse powder	10	drm.
Sugar	1½	oz.

Macerate for eight days, and filter.

In this case, care must be taken to have the gelatine and wine reaction complete before adding the cinchona; otherwise the alkaloid may be thrown out by the tannin of the wine.

Improved Quinine Wine.—

Gelatine	15	grn.
Distilled water	2½	drm.

Dissolve, and add to—

Sherry wine	29½	oz.

Shake, and set aside to clear; then add the following solution:

Hydrochlorate of quinine	30	grn.
Dilute hydrochloric acid	30	drops.
Water	½	oz.

After a week filter.

This is double the strength given by Dieterich.

To Mellow Wines.—Cover the orifices of the vessel containing it with bladder closely fastened, instead of the usual materials, and an aqueous exhalation will pass through the bladder, leaving some fine crystallizations on the surface of the wine, which, when skimmed off, leaves the wine in a highly improved state of flavor. Remnants of wine covered in this manner, whether in bottles or in casks, will not turn mouldy as when stopped in the usual way, but will be improved instead of being deteriorated.

British Red Moselle.—Malmsey, colored with clarified elderberry juice.

British Sparkling Moselle.—From rich cider apples (carefully peeled and garbled), pressed with one-fourth of their weight of white magnum bonum plums (previously stoned), and the juice fermented with 2½ lb. double refined sugar per gal., as champagne.

Mould. See *Management of Wine*, on page 615.

Mulberry.—1. Juice of the fruit, 10 gal.; or of mulberries, bruised, 15 gal.; water, 15 gal.; sugar, 35 gal. Boil and ferment, then add spirit, 2 or 3 gal.; red tartar, 7 oz.; cassia, ½ oz.; bitter almonds, ½ oz.

2. Ripe mulberries, ripe apples, equal quantities; sugar or honey, 1 lb. to the gal. Express the juice, put it into a cask, and add the sugar. Ferment with yeast, 1 qt. to every hhd.; catechu, ½ lb.; red argol, ½ lb.

Mulled Wine.—Take ¼ oz. bruised cinnamon, ½ nutmeg, grated, and 10 bruised cloves. Infuse them in ½ pt. boiling water for an hour, strain, and add ½ oz. white sugar. Pour the whole into 1 pt. hot port or sherry wine. This is a good cordial and restorative in low stages of fever, or in the debility of convalescence from fevers.

British Muscatel.—As British sparkling moselle, with some infusion of clary, or of the musk plant, to flavor it.

Orange Wine.—The oranges must be perfectly ripe. Peel them and cut them in halves, crosswise of the cells; squeeze into a tub. The press used must be so close that the seeds cannot pass into the must. Add 2 lb. white sugar to each gal. sour orange juice, or 1 lb. to each gal. sweet orange juice, and 1 qt. water to each gal. of the mixed sugar and juice. Close fermentation is necessary. The resultant wine is amber colored, and tastes like dry hock, with the orange aroma. Vinegar can be made from the refuse, and extract from the peels.

Peach, to Make.—Take of cold soft water, 18 gal.; refined sugar, 25 lb.; honey, 6 lb.; white tartar, in fine powder, 2 oz.; peaches, 60 or 80 in number. Ferment, then add 2 gal brandy. This will make 18 gal.

The first division is to be put into the vat, and the day after, before the peaches are put in, take the stones from them, break them and the kernels, then put them and the pulp into the vat.

Pepsin Wine.—

White gelatine, in strips	15	grns.
Distilled water	2½	drm.
White wine	25	oz.

Detannate as described. At the same time mix together—

Pepsin	7	drm.
Glycerine	6	drm.
Distilled water	6	drm.

Add to the wine along with 40 min. of hydrochloric acid; macerate for eight days, shaking occasionally; then filter.

Port.—

1. Ripe fruit	4	lb.
Clear soft water	1	gal.
Sugar	3	lb.
Cream tartar dissolved in boiling water	1½	oz.
Brandy	2 to 3%	

Flavoring as required.

The addition of an equal quantity of fruit and sugar increases the strength.

2. Add to 10 gal. prepared cider, 2 gal. genuine port wine; 2 qt. best cognac brandy; 1 pt. simple syrup; 1 lb. bruised raisins; 1 oz. tincture kino; ½ oz. extract rhatany; 3 qt. proof spirits. Allow it to stand for two weeks, rack, fine and repeat if necessary. Keep the wine cool.

3. British Port, London Port, Southampton Port.—

Red Cape	2	gal.
Damson or elder wine	1	gal.
Brandy	½	pt.
Powdered kino	½	oz.
4. Strong old cider	6	gal.
Elderberry juice	4	gal.
Sloe juice	3	gal.
Sugar	28	lb.
Powdered extract of rhatany	1	lb.
At time of racking add brandy	½	gal.
Good port wine	2	gal.

5. Good port, 12 gal.; rectified alcohol, 6 gal.; French brandy, 3 gal.; strong rough cider, 42 gal.; mix in a well sulphured cask.

6. Port wine, 8 gal.; brandy, 6 gal.; sloe juice, 4 gal.; strong rough cider, 45 gal.; as the last.

7. Cider, 24 gal.; juice of elderberries, 6 gal.; sloe juice, 4 gal.; rectified alcohol, 3 gal.; brandy, 1½ gal.; powdered rhatany, 7 lb.; isinglass, 4 oz.; dissolved in a gallon of cider; bung it down; in three months it will be fit to bottle, but should not be drunk until the next year; if a rougher quality is required, the quantity of rhatany may be increased, or alum, 5 or 6 oz. (dissolved in water), may be added.

Quinine Wine.—Break into small pieces 1 oz. of sulphate of quinine, and put it in a glass jar with 2 oz. of 90% Alcohol; let the quinine infuse for twenty-four hours; add 1 qt. of claret, and let it remain thus for twelve days; then filter the wine through a felt bag, and bottle for use. The above quantity of quinine may be dissolved, without the addition of alcohol in any of the following wines: Medeira, Marsala, Malaga, Lunel, or Alicant.

Racking Wine. See *Management of Wine*, on page 615.

Red Wine.—

Cider	16	gal.
Honey	27	lb.
Tartar (red)	8	oz.
Raw sugar	3	lb.
Sliced red beet	6	lb.

Boil, ferment, add—

Cassia	½	oz.
Ginger	½	oz.
Spirit	5	qts.

Ripening of Wine. See *Mananagement of Wine*, on page 615.

Ropiness of Wine. See *Management of Wine*, on page 615.

Senna Wine.—

Alexandrian senna leaves	1½	oz.
Sherry wine	27	oz.

Macerate for eight days, press and strain; then add 5 grns. of gelatine dissolved in 2½ drm. of distilled water, and then the following:

Tincture of orange peel	1	oz.
Tincture of ginger	½	oz.
Aromatic tincture	80	min.
Honey	2	oz.

Again allow to stand for ten days, and filter. This wine is an excellent aperient for persons suffering from hemorrhoids. It should be taken in tablespoonfuls, according to the effect desired.

Sherry Wine.—1. To 8 gal. prepared cider add 6 qt. best sherry wine; 1 gal. native wine; ¼ drm. oil bitter almonds cut in ½ pt. alcohol; 3 gal. proof spirits; 1 lb. sugar; saffron to color. Let the wine stand for ten days, rack and fine.

2. Cape or raisin wine slightly flavored with a very little bitter almond cake, or, what is more convenient, a little of the essential oil dissolved in alcohol (essence of bitter almonds).—3. To the last add a minute quantity of sweet brier, eau de fleurs d'oranges, or orris, to give it a very slight bouquet.—4. To each gal. of strong raisin must, add, when racking, 1 Seville orange and 2 bitter almonds, both sliced. By omitting the almonds, and adding 2 or 3 green citrons to each 10 gal., this forms British Madeira:

5. Loaf sugar	32	lb.
Sugar candy	10	lb.
Water	16	gal.

Boil, add pale-ale wort (as for Madeira), 6 gal.; yeast, 1 lb.; on the third day add raisins, stoned, 10 lb.; and in another two or three days brandy 1 gal.; bitter almonds, grated, 1 dr.; bung it down for four months, draw it off into another cask, add brandy 1 gal., and in three months bottle it.—6. Teneriffe, slightly flavored with cherry laurel or almonds, forms a most excellent British sherry, either alone or diluted with an equal quantity of Cape or raisin wine.

Sour Grapes, Sherry Wine from.—The way an imitation sherry is made in England is to mix equal quantities of new cider and honey, and evaporate to a density so that a fresh egg will float so as to be half immersed. The liquid is then cooled and kept in a stone vessel at a temperature of from 60° to 67° Fah., until in about twelve or fourteen days the peculiar smell of the fermentation is strongly established; then the liquid is put into a barrel, closed up, and placed in a cool cellar to settle; after three or four days it will be cleared; it is then bottled, and six weeks later is fit for drinking. We believe that grape juice may be used in place of cider; but if too acid, sugar and water would only make a kind of lemonade, and spoil the sherry taste, which is not acid. Sugar does not destroy this, but sulphite of lime is the proper material (not sulphate).

Sourness in Wine, to Correct a Bad Taste and Sourness.—Put in a bag the root of wild horseradish cut in bits. Let it down in the wine and leave it there two days; take this out and put in another, repeating the same till the wine is perfectly restored. Or fill a bag with wheat; it will have the same effect.

Sour Wine, to Restore.—1. Take calcined gypsum, in powder, 1 oz.; cream of tartar, in powder, 2 oz.

Mix them in a pint or more of brandy; pour it into the cask; put in, also, a few sticks of cinnamon, and then stir the wine without disturbing the lees. Bung up the cask next day.

2. Boil 1 gal. of wine with some beaten oyster shells and crab's claws, burnt into powder, an ounce of each to every 10 gal. of wine; then strain out the liquor through a sieve, and when cold, put it into wine of the same sort, and it will give it a pleasant, lively taste. A lump of unslaked lime put into each cask will also keep the wine from turning sour.

Wine, Spirits of. See **Alcohol.**

Strawberry Wine.—Take of cold, soft water, 7 gal.; cidar, 6 gal.; strawberries, 6 gal. Ferment. Mix raw sugar, 16 lb.; red tartar, in fine powder, 3 oz.; the peel and juice of 2 lemons; then add brandy, 2 or 3 qt. This will make 18 gal.

Another.—Take of cold, soft water, 10 gal.; strawberries, 9 gal. Ferment. Mix raw sugar, 25 lb.; red tartar, in fine powder, 3 oz.; 2 lemons and 2 oranges, peel and juice; then add brandy, 1 gal. This will make 18 gal.

To Sweeten Wine.—In 30 gal. of wine infuse a handful of the flowers of clary; then add 1 lb. of mustard seed, dry ground, put it into a bag, and sink it to the bottom of the cask.

Tartaric Acid in Wine, Detection of Free.—Professor Claus evaporates to a syrup and agitates with ether. If free tartaric acid is present, the ether leaves, on evaporation, a crystalline deposit, which, if dissolved in water, gives, on the addition of an alcoholic solution of potassic acetate, a precipitate of tartar. The author proves the solubility of tartaric acid in ether, which is denied in most text books.—*Polyt. Notizblatt.*

British Tokay.—To good cider, 18 gal., add of elderberry juice, ½ gal.; honey, 28 lb.; sugar, 14 lb.; red argol, in powder, ¾ lb.; crystallized tartaric acid, 3 oz.; mix, boil, ferment, and, when the active fermentation is complete, add of brandy, 1 gal., and suspend in the liquid from the bunghole a mixture of cassia and ginger of each, ½ oz.; cloves and capsicum of each, ¼ oz.; the whole bruised and loosely inclosed in a coarse muslin bag. It will be ripe in 12 months.

White Wine.—

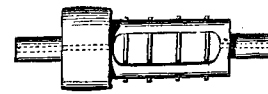
Cider	100	gal.
Honey	80	lb.
Sugar	20	lb.

Mix and ferment. Add 6 gal. spirit; white tartar, 1½ lb.; bitter almonds bruised, 1 oz.

Wire, *to Ascertain Amount Required for Cable.*—For the length of a wire in a strand, add to a given length as many times the circumference of the strand as there are twists in the given length, for the outside wires; and proportionately for the inner row. The center wire is supposed to be straight. Proceed in the same way for the strands. The excess of wire in each strand added to the excess of the strands over the length of the cable will give the whole length of wire used.

Wire Rope, to Preserve.—Apply raw linseed oil with a piece of sheepskin, wool inside; or mix the oil with equal parts of Spanish brown and lampblack. To preserve wire rope under ground or in water, take mineral or vegetable tar, add 1 bushel of fresh slaked lime to 1 barrel of tar, which will neutralize the acid; boil it well, then saturate the rope with the boiling tar.

Wire, to Straighten.—Such a tool is shown in the accompanying cut. It consists of a cast-



ing about 10 in. in length, having on each end a bearing which may be supported in suitable boxes. The pulley is a part of the casting, and is 3 in. in diameter and 2 in. wide. Four steel pins are inserted 1 in. apart and a little to one side of a central longitudinal line. A hole a little larger than the wire to be straightened is drilled axially through the bearing. The wire passes through the tool over and under the steel pins. It is well lubricated and is pulled through as the tool revolves rapidly.

Wire, Comparison of Gauges, Resistance, etc. See Appendix.

Woad.—*Isatis sativa*, a plant containing a small amount of indigo, formerly used as a dye, now added to indigo vats for wool dying, as a promoter of fermentation. A variety of the plant cultivated in the south of France is known under the name of pastel, whence the term pastel vat, applied to a kind of indigo vat.

Wood's Alloy. See **Alloys** *(Fusible).*

Wood, Brazil.—A soft red wood produced by *Cæsalpinia cristata*, a tree growing in Brazil. The wood is brought over in irregular knotty masses. When freshly chipped it has a yellow color, but on exposure to air and moisture it turns reddish. It may be distinguished from the other hard, red woods, by the circumstance that it speedily imparts a bright red color to water.

Wood, Cam (Kambe Wood).—Camwood is obtained from Sierra Leone, the Gaboon, and other parts of the west coast of Africa. It belongs to the hard section of the red woods. It yields its coloring matter to water much more readily than barwood and sanders, but much less freely than Brazil wood. No true, permanent extract of camwood can be said to exist, since boiling water charged with its coloring principle, redeposits the same on cooling, and retains merely a trace.

Wood, Bone Surface on.—Levigated oxide of tin, prepared putty powder, 1 oz.; powdered oxalic acid, ¼ oz.; powdered gum, 20 grn.; make into a stiff paste with water, and evenly and thinly spread it over the strap. If it does not stick, use glue.

Wood, to Bronze. See **Bronzing.**

Wood, Cement for. See **Cements.**

Wood, Cracks in.—Melt equal parts of pitch and gutta percha in an iron pot; thoroughly mix by stirring. Make up in sticks and melt into the cracks with a warm iron.

Wood, Enamel for. See **Enameling.**

Wood, Cheap Finish for.—A cheap polish to brighten hard oil finished work after being rubbed.

Gum shellac	1 oz.
Gum arabic	¼ oz.
Gum copal	¼ oz.

Powder and sift through a piece of muslin; put them in a closely corked bottle with 1 pt. alcohol, in a warm place, shaking every day till the gums are dissolved, then strain and bottle.

Wood, to Fireproof. See **Fireproofing.**

Wood, Glue for. See **Glues.**

Wood, to Harden.—Wood steeped in a solution of iron sulphate or copperas becomes very hard and almost indestructible.

Wood, to Petrify.—Wood may be petrified by placing it in the following mixture after the ebullition has ceased: Equal parts chalk pebbles powder, white vinegar, gem salt, and rock alum. Mix well. Not recommended.

Wood, to Polish. See **Polishing.**

Wood, to Protect.—Paraffine and creosote are good preservatives for fence posts and shingles, but too expensive for general use. Coal tar is much used, and is no doubt cheaper. Crude paraffine can be had at from 7 to 8 cents a pound. Crude creosote about the same.

Wood, Oiling of.—Wagon makers or repairers can save their stock from worms by oiling with linseed oil. Single trees, double trees, neck yokes, spokes, and cross bars that are of white hickory, and are kept in stock for a year or more, will be eaten by worms if not kept in a dark place or otherwise protected. Coal and kerosene oil are good also, and the expense of applying is but little. Linseed oil is preferable, as it acts to some extent as a wood filler, filling the pores and thus aiding the painting, which follows in its proper place. Some manufacturers oil all their white hickory stock before shipping.—*Lumber World*

Wood, Preservation of.—1. The improved French method of preserving wood by the application of lime is found to work well. The plan is to pile the planks in a tank, and to put over all a layer of quicklime, which is gradually slaked with water. Timber for mines requires about a week to be thoroughly impregnated, and other wood more or less time, according to its thickness. The material acquires remarkable consistence and hardness, it is stated, on being subjected to this simple process, and the assertion is made that it will never rot. Beechwood prepared in this way for hammers and other tools for iron work is found to acquire the hardness of oak, without parting with any of its well known elasticity or toughness, and it also lasts longer.—*Amer. Building News.*

2. Dry Rot, to Preserve from.—The best way to preserve a timber exposed to the action of the weather is to force into the pores of well seasoned wood as much carbolic acid, or creosote, as possible. This soon resinifies, and most effectually prevents the timber from dry rot and decay. On a large scale, as for railway sleepers, expensive appliances are needed; but for barns or outbuilding, it may be applied to considerable advantage by the use of a paint brush.

3. Burnettizing.—A solution of 1 lb. chloride of zinc to 4 gal. water for timber, and 1 lb. chloride of zinc to 5 gal. water for canvas, cordage, etc., in a wooden tank. These were the proportions originally specified; 1 lb. of the salt to 9 or 10 gal. water, are now more frequently used. Timber requires to be immersed for about two days for each in. in thickness, and afterward taken out and left to dry for about fourteen to ninety days. Canvas, ropes, etc., require to be immersed in the solution for about forty-eight hours, then taken out and dried. The process on wood may be more expeditiously performed by forcing the solution into the pores with a pressure of 150 lb. to the sq. in. The advantage of this process is that it renders the material to which it is applied incombustible.

4. Kyanizing.—The timber is immersed in a saturated solution of corrosive sublimate (bichloride of mercury) in a wooden tank, put together so that no metal of any kind can come in contact with the solution. One lb. corrosive sublimate to 10 gal. water is used when a maximum strength is required, and 1 lb. to 15 gal. water when a minimum, according to the porosity of the timber; with the latter proportion, 1½ lb. will be sufficient for a load of timber of 50 cub. ft. Corrosive sublimate dissolves best in tepid water. The time required to saturate the timber depends on its thickness; twenty-four hours are usually allowed for each in. in thickness for boards and small timber; large timber requires two to three weeks.

5. Payne's.—Impregnating the wood, while in a vacuum, with a strong solution of sulphate of iron, and afterward forcing into the timber a solution of sulphate of lime, or any of the alkaline carbonates, such as carbonate of soda, by which means the oxide of iron becomes insoluble. The wood is also rendered incombustible by this process.

6. To Preserve Woodworks that are Exposed to Damp.—For those of an extensive nature, such as bridges, etc. The Hollanders use for the preservation of their sluices and floodgates, drawbridges and other huge beams of timber exposed to the sun and constant changes of the atmosphere, a certain mixture of pitch and tar, upon which they strew small pieces of shell broken finely—almost to a powder—and mixed with sea sand, and the scales of iron, small and sifted, which incrusts and preserves it effectually.

7. A paint composed of sub-sulphate of iron (the refuse of the copperas pans), ground up with any common oil and thinned with coal tar oil, having a little pitch dissolved in it, is flexible, and impervious to moisture.

8. Linseed oil and tar, in equal parts, well boiled together, and used while boiling, rubbed plentifully over the work while hot, after being scorched all over by wood burnt under it, strikes ½ in. or more into the wood, closes the pores, and makes it hard and durable either under or out of water.

9. For fences and similar works, a coating of coal tar, sanded over; or boil together 1 gal. coal tar and 2½ lb. white copperas, and lay it on hot.

10. To prevent rot. Thoroughly season the wood before fixing, and when fixed, have a proper ventilation all round it.

11. Charring, after seasoning, will fortify timber against infection; so will a coating of coal tar.

12. To Cure Incipient Dry Rot—If very much infected, remove the timber, and replace with new.

13. A pure solution of corrosive sublimate in water, in the proportion of 1 oz. to 1 gal., used hot, is considered a very effectual wash.

14. A solution of sulphate of copper, ½ lb. per gal. of water, laid on hot.

15. A strong solution of sulphate of iron; this is not so good as sulphate of copper.

16. A strong solution of sulphates of iron and copper in equal parts, ½ lb. of the sulphates to 1¼ gal. water.

17. Paraffin oil, the commonest and cheapest naphtha and oil, or a little resinous matter dissolved and mixed with oil, will stay the wet rot.

18. Remove the parts affected, and wash with dilute sulphuric acid the remaining woodwork.

19. Dissolve 1 lb. sulphate of copper in 1 gal. boiling water, then add 1¼ lb. sulphuric acid in 6 gal. water, and apply hot.

20. To Prevent Worms in Timber.—Anointing with an oil produced by the immersion of sulphur in aquafortis (nitric acid) distilled to dryness, and exposed to dissolve in the air.

21. Soaking in an infusion of quassia renders the wood bitter.

22. Creosoting timber if the smell is not objectionable.

23. Anointing the timber with oil of spike, juniper or turpentine, is efficacious in some degree.

24. For small articles, cover freely with copal varnish, in linseed oil.

25. To Prevent Worms in Marine Building.—A mixture of lime, sulphur, and colocynth with pitch.

26. Saturating the pores with coal tar, either alone or after a solution of corrosive sublimate has been soaked and dried into the wood.

27. Sheathing with thin copper over tarred felt is esteemed the best protection for the bottoms of ships for all marine animals; the joints should be stopped with tarred oakum.

28. Studding the parts under water with short broad-headed nails.

29. To Destroy Worms in Carvings.—Fumigate the wood with benzine.

30. Saturate the wood with a strong solution of corrosive sublimate; if used for carvings, the color should be restored by ammonia, and then by a weak solution of hydrochloric acid; the holes may be stopped up with gum and gelatine, and a varnish of resin dissolved in 90% alcohol should afterward be applied to the surface.

31. Whale oil and poisonous ointments have been found of service. The wood should be carefully brushed before being operated upon.

32. To Destroy Ants and Insects in Wood.—Corrosive sublimate is an effectual poison to them.

33. Oils, especially essential oils, are good preventives.

34. Cajeput oil has been proved effectual for destroying the red ant.

35. Payne's, Bethell's, and Burnett's processes are said to be proof against the white ant of India.

36. Dust the parts with pounded quicklime, and then water them with the ammoniacal liquor of gas works, when the ammonia will be instantly disengaged by the quicklime, and this is destructive to insect life.

37. For the black ant, use powdered borax; or smear the parts frequented by them with petroleum oil; or syringe their nests with fluoric acid or spirits of tar, to be done with a leaden syringe; or pour down the holes boiling water to destroy their nests, and then stop up the holes with cement. Ants dislike arsenic, camphor and creosote.—Britton.

38. Nicholson, noting that railway sleepers lying on ground which had formerly been the bed of a salt lake, in Nebraska, retained their power to resist decay for an unusually long period, and showed an excess of alkaline salts in their ash, suggests that here is a cheap and effective preservative.

39. Lostal, a French railway contractor, recommends the use of quicklime for preserving timber. He puts the planks in tanks and covers them with quicklime, which is gradually slaked with water. Timber, such as is used in mines, takes about a week to become thoroughly impregnated. The wood acquires a remarkable hardness and toughness, and, it is said, will never rot. Beechwood has been prepared in this way for hammers and other tools in several ironworks, and is reported to have been as hard as oak, without losing its peculiar elasticity.

40. Wood will be effectually preserved from the action of the air if it is covered by a paint brush with a solution of persulphate of iron, marking 2° to 2½° B. The blue tint which is developed by drying changes to brown when a coat of linseed oil is laid on.—*Revue Indust.*

41. Lay timber up, when perfectly dry, in an airy place, that it may not be exposed to the sun or wind, and taking care that it does not stand upright, but let it be laid along, one piece upon another, interposing here and there some short blocks, to prevent that mouldiness which is usually contracted when planks sweat. Lay planks in a stream of running water for a fortnight, and then set them up in the sun and wind, so that the air may freely pass between them, and turn them frequently. Boards thus seasoned will floor much better than those which have been kept in a dry place for many years. Elm, felled ever so green, if kept for four or five days, obtains a good seasoning and is rendered fit for immediate use. This water seasoning is not only a remedy against the worm, but also prevents distortions and warping. Where huge massy columns are to be used, it is a good plan to bore them through from end to end, as it prevents their splitting. Timbers occasionally laid in mortar, or any part contiguous to lime, have sometimes been capped with melted pitch as a preserver from the destructive powers of lime; but it has been found to be rather hurtful than otherwise.

42. For the purpose of preserving timber for mines, Koug packs the timber, cut in proper lengths, in a vertical position in an iron reservoir, provided with a tight fitting cover. The vessel is then filled to about three-fourths of its capacity with a solution of the carbolate of soda. Into this he leads live steam, which speedily brings the liquid to the boiling point. The access of the steam is continued until, by its gradual condensation, it has filled the vessel to its full capacity. The wood is then allowed to remain in the hot liquid some hours; this is drawn off, and the wood washed off with a dry steam jet.

43. Hock dissolves paraffin in ligroin, so-called petroleum ether, kerosene or other convenient substances, and immerses the wood to be preserved in the solution, care being taken that the wood is as dry as possible. After impregnation, the saturated wood is heated in a large retort provided with a condensing arrangement, whereby the volatile solvent is expelled and condensed for use over again, while the paraffin is left in the pores of the timber. Crude paraffin (containing much liquid hydrocarbons) may be employed.

44. At Bellagio, on the lake of Como, where olive wood is used in large quantities for the formation of various articles of turnery, the plan adopted for seasoning the wood is to boil it for about ten minutes, and then let it dry gradually for months before using it.

45. The best preservative against dry rot, according to the American *Journal of Pharmacy*, is the following:

Oil of cassia	1 part.
Wood tar	1 part.
Train oil	1 part.

Apply 3 coats on the reverse sides and on the ends of planks, floors, etc. In all probability oil of cassia plays the chief rôle as preservative.

46. During the excavation of a canal in Berlin, the workmen struck upon 12 perfectly preserved coffins, which lay apparently in 4 graves, each containing 3 superimposed coffins. The site of the discovery corresponds with the cemetery that existed even as late as 1620 in connection with the poor house and pestilent hospital. The corpses must in consequence have been in the earth for at least 260 years. Notwithstanding this long period, the coffins, as well as their contained bones, are in a perfect state of preservation; articles of clothing have even been found still clinging to some of the bones. Prof. Virchow found upon investigation that the coffins were coated on both sides with a thick layer of tar, the wood itself appearing to be young oak, 1 inch in thickness. A silicious crust was likewise found on the inner side of the coffins. The wood is so hard that axes and saws were broken in the attempt to cut it.

47. Jacques first impregnates the timber thoroughly with a simple solution of soap mixed with an acid—preferably phenic acid. This causes the formation in a few days, within the wood, of a fatty acid, which is insoluble in water, and impregnates the remotest fibers. The reaction of the acid on the soap does not take place until a portion of the water has evaporated. It is claimed that more perfect impregnation can be had in this way than with creosote, and there is no danger of the washing out of the preservative from the exposed surfaces, as when sulphate of copper is used. The government commission on technical railroad operation in France is said to favor this process.

48. Card impregnates the wood with a solution of zinc chloride or other antiseptic soluble mineral salt, then dries the outer layers of the wood by heated air currents, and finally saturates with hot creosote oil. The creosote oil is to prevent the soluble antiseptic from being washed out.

49. Richard uses common salt, in a chemically pure crystallized form, as the most efficacious preservative of timber. In combination with alum, absolute incombustibility, it is said, can be insured by its use.—*Revue Indust.*

50. The well known methods of preserving posts and wood which are partly embedded in the earth, by charring and coating with tar are only effective when both are applied. Should the poles only be charred without the subsequent treatment with tar, the charcoal formation on the surface would act as an absorber of the moisture, and, if anything, only hasten the decay. By applying a coating of tar without previously charring, the tar would only form a casing about the wood, nor would it penetrate to the depth which the absorbing properties of the charcoaled surface wound insure. Wood that is exposed to the action of water or let into the ground should first be charred, and then before it has entirely cooled be treated with tar till the wood is thoroughly impregnated. The acetic acid and oils contained in the tar are evaporated by the heat, and only the resin is left behind, which penetrates the pores of the wood and forms an airtight and waterproof envelope. It is important to impregnate the poles a little above the line of exposure, for here it is that the action of decay affects the wood first, and where the break always occurs when removed from the earth or strained in testing.—(*Ind. Blatt.*)

51. Müller employs for the preservation of wood the phosphate of baryta formed within the fiber. The wood is first steeped in a solution of the phosphate of soda containing 7% of the salt. When dry, the wood is again treated with a solution of chloride of barium containing 13%.

52. Leech takes 1 lb. arsenious acid and dissolves it in 4 gal. water; to this he adds 1 lb. carbonate of soda, stirring the mixture till it is thoroughly dissolved. In a separate vessel he makes a solution of 16 lb. sulphate of copper in 16 gal. water, mixes the solutions together, and places them in a wooden or lead lined vat. The timber is placed in this bath, and the solution heated by means of steam to the boiling point. A few hours' soaking is said to be sufficient, but when heat is not applied the wood must remain for at least two or three days. These solutions are applicable to wood that is already in permanent position, as telegraph poles, fences, and gates. In these and similar cases one solution should be painted on and allowed to dry before the other is applied. When possible, they should be laid on hot.

53. Mewburn's process, so far as oak is concerned, consists simply in boiling the wood in a solution of gallo-tannic acid, the proportions of the respective ingredients being apparently immaterial. The result is the formation of an insoluble substance in the pores of the wood. One solution only is necessary for oak, on account of the tannin naturally present in that wood, the endurance of which in moist situations is proverbial. A consideration of this fact led Hatzfeld to try the effect of impregnating timber with tannin, and afterward with acetate of iron, a process which is both cheap and useful, and which is at present being tested by a telegraph company in France.

54. Posts and pier piles can be rendered nearly indestructible by boring one or more holes, larger or smaller, in the center of the butt, the whole length if desirable; then fill with boiling coal tar and close the aperture with a long taper wedge, well driven home, which will give pressure to force the antiseptic into the inner heart pores of the mould. Were posts thus preserved, and the exterior surface dressed with resin varnish, they would last for centuries. Wood exposed to the air should not be dressed with coal tar, but Stockholm tar or resinous varnish; the former will rot the fibers when exposed to sun and air. Mark the posts at 6 or 8 in. above the depth they are to be placed in the earth, and bore the hole up to the mark. Then fill in with boiling coal tar, plug up the hole, and the base of the post will outlast the upper part. The writer has also had occasion to stand posts under floor joists, as a support, when, by making a clay puddled hole, and pouring into it a gallon of boiling coal tar as a bed for the post to stand in, it would never decay.—*English Mechanic.*

55. Wood is rendered extremely durable and weatherproof by covering it with hot linseed oil varnish, several coats being applied, each one after the preceding one is dry; finally oil colors are applied as required. The drying requires a longer time than the ordinary process of painting.—*Dingler's Polytech. Jl.*

56. The following recipe is said to be a cure for dry rot: Melt 12 oz. rosin in an iron pot, add 3 gal. train oil and 3 or 4 rolls brimstone; when it is thin add Spanish brown or red and yellow ocher, or what color preferred; put on the wood hot and thin with a brush; give two coats.

57. Villain & Co., of Berlin, manufacture, under the name of mycothanation, a product which has the property of destroying dry rot in houses and other buildings and preventing its appearance in new ones. It may also be employed with advantage in seasoning railway sleepers, telegraph posts, beams, etc., which it effectually preserves from decay. It is a clear liquid, containing no poisonous or disagreeably smelling substance. Its presence in the atmosphere is good for the health, as it destroys miasma and ferment. Lastly, wood impregnated with it does not easily catch fire, which has been repeatedly proved. It requires boiling in a cast iron boiler, and in this state is to be spread over the surfaces covered with dry rot by means of a large brush. During the boiling the boiler must be kept carefully closed. Wood which is to be impregnated with it must be first cleaned. The efflorescence of masonry may be prevented by smearing the walls with this liquid. In old buildings the efflorescence should be first scraped, and after a layer of the liquid has been put on, the walls can be restored.—*Pract. Mag.*

58. Melsens impregnated blocks of wood with tar by alternate heatings and coolings; they were then kept two years in a corner of a garden in earth saturated with the products of a urinal, and were unaltered; on breaking across it was found that lines were noticeable where the tar had not penetrated completely; the one set of split halves were kept some years in ordinary earth, the others carefully preserved; they were then steamed at 212° F. (100° C.), for twelve hours, quickly cooled in water, frozen, and left out in the open air all winter, at the end of which time they were unaltered. They were then placed in a wet situation in a garden, then on an isolated building, and then in sandy soil under a rain water tub. Finally, after twenty years' exposure to varied deteriorating agencies, no change whatever was produced in them. By utilizing the mechanical force of condensing steam, or of the atmosphere, wood may be wholly or partially injected with tar, or other preservative agents; when not preserved, the natural course of decay is along the direction of growth, and not across it; the direction in which the preservative body is forced into the wood is the same. When the wood is only superficially injected it is desirable that it should be shaped into the required form before applying the preservative process. —*Moniteur Quesneville.*

59. The value of creosote as a wood preserver is generally recognized, but the direct injection

requires great quantities of heavy oil and a desiccation of the injected pores. The high boiling point of creosote does not permit its employment in vapor. Blythe formed the idea of saturating a jet of steam with creosote in minute division, forming, so to speak, a gaseous emulsion. The apparatus comprises a high pressure steam boiler; another boiler containing creosote, in which the steam is saturated; a vat, filled with creosote, to be pumped into the boiler; sheet iron cylinders, for the pieces which are to be injected; and a system of tubing connecting the several parts. In this way Blythe completely fills the heart of oak, pine, or red beech; he uses 4 to 6 lb. of creosote for a cross tie, and 4 lb. of brown phenic acid per cubic yard of saturated wood or cross ties. The apparatus can prepare 500 ties per day. The wood comes out softened, so that it can readily be bent or shaped, but it rapidly hardens. At first it shrinks, but after a few weeks it becomes seasoned, and resists the influences of moisture. Finally, the fibers are greatly strengthened.

60. Krug employs the following simple preparation for preserving wood used in mines by a combination of creosote and soda: An iron basin, ⅛ in. thick, about 6½ ft. deep, and 4 ft. in diameter, is sunk in the ground rather more than half its depth. By the side, and with its rim below the bottom of the first basin, is a second, not quite half its size. A third basin, about midway between the other two in size, stands with its lower edge rather higher than the upper rim of the first basin. This first one is provided with a cover, half of which is screwed on; the other half may be opened or shut close. Above the bottom it has a sieve bottom of wire gauze, and at the bottom a discharge cock. Moreover, a pipe goes to the bottom, through which steam can be directly conveyed. From beneath the upper edge a pipe passes over the edge into the second basin. In the second basin is a hand forcing pump for pumping the impregnating fluid into the third basin, which is furnished with a discharge cock. The operation is as follows: The pieces of wood to be impregnated are cut to the suitable lengths required for door posts, lintels, piles, etc., and placed perpendicularly, as closely as possible together, in the first basin, the cover of which is then closed. It is not necessary that the cover should be air tight. Meanwhile the third basin has been filled with creosote soda lye, either directly or out of the second basin, by means of the hand pump. The lye is then admitted into the first basin till it is about ¾ full, and then steam is conveyed directly through the pipe mentioned before to the lye. The fluid gradually begins to boil, while it is increased by the condensation water of the steam which pours in, and at last begins to flow away through the pipe which passes over the edge of the second basin. The steam is then turned off, and the wood may be left to boil for some time in the lye. When at last the lye has been discharged, and the wood been acted upon by direct steam, the cover of the basin is opened, and the impregnated wood removed. Although wood treated in this way is penetrated with the impregnating fluid only to the depth of ⅛ in. to ¾ in., it has been found perfectly unimpaired after five years in districts where wood not so treated rots and becomes unfit for use after nine or twelve months. Above ground and in places where there is no danger of fire, it is sufficient to pour creosote oil over the wood. In a few days the wood will be sufficiently penetrated to withstand the action of the weather.—*Stummer's Ingénieur.*

61. The following method of preserving garden labels is recommended in a German paper:

Thoroughly soak them in a strong solution of copperas (sulphate of iron), then, after being dried, lay them in lime water. This causes the formation in the wood of calcium sulphate, a very insoluble salt. The rapid destruction of labels by exposure to the weather is thus, it is said, prevented. Bast, mats, twine, and other substances used in tying up or covering trees and plants, when treated in the same manner, are similarly preserved. At a recent meeting of a horticultural society in Berlin, wooden labels treated thus were exhibited, and although they had been continually exposed for two years, they were apparently in no way affected.

62. Paulet compares the relative advantages of copper sulphate and creosote. As regards the former preservative, this salt is poisonous to the vegetable and animal parasites which appear at the beginning of all organic decomposition. The quantity of salts of copper should be excessive when the wood is intended to be immersed in water or buried in a moist soil, because the water dissolves this salt slowly; and since sea water enters into combination with it still more rapidly, it should be excluded from use for wood used in the sea. There is, in wood inpregnated with the salts of copper, a portion of the sulphate closely united with the ligneous tissue, and another portion in excess remaining free. The latter portion dissolves first, and, carried off by the exterior fluids, only retards the loss of the metallic salt combined with the wood; but this combination itself, although more stable, does not escape removal, being accelerated or retarded according to the rapidity and ease with which the dissolving liquid is renewed. On the contrary, the quantity of metallic salts should be diminished in wood intended for constructions in the open air, in order to prevent the mechanical effect of intra-vascular crystallizations. As regards creosote oil, it is beyond doubt that the petroleum products, containing phenic acid, are preferable to the metallic salts for wood exposed to sea water, because naphthalene, and especially phenic acid, exert an antiseptic action, coagulate the albumen, and thus obstruct the circulation of the sap or blood of parasites. The volatility and the solubility of these preservative agents would render their antiseptic action temporary only, if the more fixed and thicker oils which accompany them did not inclose and retain the preceding substances, at the same time obstructing all the pores of the wood, and rendering difficult the access of dissolving liquids and destructive gases. On the other hand, grave objections have been raised, from a practical point of view, either because of the restricted production of these oils, which is not sufficient for a general use of them, or because the wood thus impregnated offers great danger from fire, this wood, once on fire, being unextinguishable; on the other hand, sulphate of copper, like all the metallic salts, renders wood uninflammable.—*Pract. Mag.*

Wood, to Stain. See **Staining.**

Wool, to Dye. See **Dyeing.**

Wringers, to Fasten Rolls on.—1. Clean shaft thoroughly between the shoulders or washers, where the rubber goes on.

2. Give shaft a coat of copal varnish, between the shoulders, and let it dry.

3. Give shaft coat of varnish and wind shaft tightly as possible with 5 ply jute twine at once, while varnish is green, and let it dry for about six hours.

4. Give shaft over the twine a coat of rubber cement, and let it dry for about six hours.

5. Give shaft over the twine a second coat of rubber cement, and let it dry for about six hours.

6. Remove washer on the short end of shaft, also the cogwheel if the shaft has cogs on both ends.

7. See that the rubber rolls are always longer than the space between the washers where the rubber goes on, as they shrink or take up a little in putting on the shaft.

8. Clean out the hole or inside of roll with benzine, using a small brush or swab.

9. Put the thimble or pointer on the end of shaft that the washer has been removed from, and give shaft over the twine and thimble another coat of cement, and stand same upright in a vise.

10. Give the inside or hole of roll a coat of cement with a small rod or stick.

11. Pull or force the roll on the shaft as quickly as possible with a jerk, then rivet the washer on with a cold chisel.

12. Let roll stand and get dry for two or three days before using same. Cement for use should be so thick that it will run freely; if it gets too thick, thin it with benzine or naphtha.

Wrinkles.—Wrinkles caused by facial contractions cannot be removed while their cause continues in operation. Withering and puckering of skin, the result of years, may be remedied by

Alum	1	drm.
Glycerine	1	oz.
Water	1	pt.

To be used three times daily as a wash; or—

Glycerine	2	drm.
Tannin	1	drm.
Rectified spirit	1	drm.
Water	4	oz.

To be used as a wash three times daily. These washes are astringent, and they do no harm, whereas, some of the much vaunted lotions sold by the perfumers are most injurious if used for any length of time.

The skin should be frequently bathed in cold water, and rubbed vigorously with the towel afterward.

Writing.—*To Restore Burned.*—Separate the charred leaves carefully, go with them in a room where no daylight can enter, light your gas, lamp or candle, and place each leaf in a solution of 40 grn. of nitrate of silver to each oz. of water, watch it, and you will soon see the writing legible. If satisfactory, take out the leaf and wash the excess of silver solution out by means of rain water; then fix the leaf with a dilute solution of hyposulphite of soda, as if it were a photograph, and you will be able to read every word on the page which is not so far destroyed that it will not hang together.

1. *Writing* (see also **Manuscripts**) effaced by chlorine can be restored by exposing it to the vapor of ammonium sulphide.

2. Dip into a solution of the sulphide.

3. Immerse the paper in a solution of ferrocyanide of potassium, 5 pt.; water, 85 parts. Slightly acidulate with sulphuric acid.

Writing Falsified.—Gobert has found that, if writing is ever so carefully scratched out, there are still left sufficient traces of the oxide of iron in the ink to become visible in a photographic copy. Light reflected from paper that has not been written on acts in a different way on the photographic materials from that reflected from places which have been once covered with ink. By this means the genuineness or otherwise of a document can always be ascertained.—*Stummer's Ingenieur.*

Writing Fluid. See **Inks.**

Writing on Glass. See **Glass.**

Writing, to Restore on Parchment.—Moisten the ink with a strong aqueous solution of tannic acid.

Process for Copying Very Old Writings.—St. Victor.—Wet ordinary copying paper with a thin solution of glucose or honey, instead of water. Put in a copying press, and when taken out, expose to the fumes of strong ammonia. This brings out clearly lines otherwise almost illegible.

To Make New Writing Look Old.—Infuse ½ drm. saffron in ¼ pt. ink. Warm over a moderate fire. It will cause whatever is written with it to turn yellow, and appear as if of many years' standing.

To Revive Old Writing.—1. Brush the writing over with potassium sulpho-cyanide and water (1·20). While tame expose to fumes of hot hydrochloric acid.

2. Wash with very weak hydrochloric acid, then apply infusion of galls.

3. If writing has been exposed to sea water, wash well and soak in gallic acid solution, 3 grn., to 1 oz. water.

4. If No. 3 does not make writing legible enough, soak in a solution of protosulphate of iron, 10 grn., to 1 oz. water.

Writing, to Transfer. See **Transferring.**

Yeast, without Ferment.—Boil ½ peck malt in 3 qt. water; pour off 2 qt., keep in a warm place 30 hours; add 4 qt. of a similar decoction, and stir well; again ferment, repeat the addition of 4 qt. until sufficient yeast is obtained.

Yeast, Brewer's.—Brewer's yeast is prepared as follows: 72 lb. unkilned malt and a handful of hops are gradually stirred in a clean tub containing 7 gal. of water of 170° F.; and to this 5½ gal. water of 200° are added. The tub is then covered tightly and left quiet. After some time it is cooled rapidly. This is accomplished by setting in cans filled with cold water. When the temperature of the mash has reached 70°, the tub is covered again and allowed to stand for some twelve hours longer, when 1½ gal. fresh beer yeast are to be stirred in. After another twelve hours have elapsed, pierce a hole in the layer formed by the husks of the malt and dip 3½ gal. of the liquor beneath, then stir the whole up and dip 1¾ gal. from it (husks and liquor). This is the mother leaven, from which yeast can be generated all the year round by using it in the way described instead of the ordinary beer leaven. To the remainder in the tub add 5 gal. wort of 90°, and make use of it within two hours. The mother yeast also must be used the same day for fermenting another portion.

Yeast, to Preserve.—The thick portion of the yeast is filled into a champagne bottle, and on top of it is poured about ⅛ in. of olive oil. The bottle is then closed by tying a bladder over its top, and in order to protect it from explosion a pin is put through the bladder. So the yeast will keep well for a *long* time if stored in a cold place.

2. Yeast, if mixed with about ⅛ pure glycerine, also keeps well for some time if in a cool place.—*Chem. Rev.*

3. The raw yeast is carefully washed with cold water, afterward the greater part of the water is removed by pressure; a further proportion is got rid of by means of a centrifugal apparatus. But as the yeast cannot be got perfectly dry in this way, it is afterward placed for that purpose in an apparatus in which a vacuum, or rarefaction of the air nearly approaching a vacuum, can be obtained. In this chamber, the moisture, still combined with the yeast, evaporates at a very low degree of heat, and the vapor formed is immediately absorbed by hygroscopic substances introduced for the purpose—as, for example, chloride of lime. The yeast is finally exposed to a current of air in its ordinary state or dried, or of carbonic acid gas, according to the prevailing temperature and other circumstances. Through these manipulations a perfectly dry powder is finally obtained, which, being hermetically sealed in glass or tin cases, will keep perfectly well for several months. When required to be used, the powder is mixed with water to the consistency of a thin paste, which acts in the same way as fresh yeast.—*Jeversen and Boldt.*

Yeast (Vienna.)—Indian corn, barley and rye (all sprouting) are powdered and mixed, and then macerated in water at a temperature of from 149° to 167° Fah. Saccharification takes place in a few hours, when the liquor is

racked off and allowed to clear, and fermentation is set up by the help of a minute quantity of any ordinary yeast. Carbonic acid is disengaged during the process with so much rapidity that the globules of yeast are thrown up by the gas, and remain floating on the surface, where they form a thick scum The latter is carefully removed, and constitutes the best and purest yeast, which, when drained and compressed in a hydraulic press, can be kept from eight to fifteen days, according to the season.

Zapon. See **Lacquers.**

Zinc, Amalgam. See **Amalgams.**

Zinc, Amalgamation of. See **Zincs** below.

Zinc, to Blacken. See **Blacking,** *Metals.*

Zinc, to Clean. See **Cleansing.**

Zinc, Etching on. See **Etching.**

Zinc, Fluxes for. See **Fluxes.**

Zinc, to Tin.—Make a bath of distilled water, 1 gal.; pyrophosphate of soda, 3¼ oz.; fused protochloride of tin, ½ oz. A thin coat of tin can be obtained by simply dipping the zinc in the bath, and one of any thickness by the aid of the battery.

Zinc, Writing on.—Mix verdigris, 1 part; sal ammoniac, 1; chimney black, or any mineral color, ½; water, 10; stir well or shake the bottle before employing, and use a quill, not a steel pen, for writing. This ink is a poison.

2. Get a lemon, squeeze the juice out of it into a pot, and put into it an old copper halfpenny or farthing, not the present bronze coin. Let it stand for a day or two. Write with a quill pen.

3. Dissolve 100 grs. of chloride of platinum in a pint of water. A little mucilage and lampblack may be added.

Zinc, to Color.—Puscher employs acetate of lead for this purpose, On applying this substance, mixed with a minium preparation, a reddish brown tinge is obtained. The cupola of the synagogue at Nuremberg was thus colored, as an experiment, a long time ago, and to all appearance is yet unaffected by the weather. By adding other bases, lighter or darker tints of gray and yellow may be obtained, giving the zinc work the appearance of carved stone. With a solution of chlorate of copper the preparation turns the sheets of zinc.—*Iron.*

Zincographic Etching. See **Etching.**

Zincs, Amalgamation of.—This is accomplished in several ways.—

1. By dipping the zinc in dilute sulphuric acid and then dipping the end of it into a small quantity of mercury, after rubbing the surface with a brush.

2. Dissolve 1 lb. of mercury in 5 lb. of nitro-muriatic acid (nitric acid 1 part, muriatic acid 3 parts), heat the solution gently to hasten the action. When a complete solution of the mercury is effected, add 5 lb. more of nitro-muriatic acid. The solution should be applied with a brush, as immersing the zinc in it is wasteful.

3. To the bichromate solution commonly used in batteries, add to every pint of solution 1 drm. of bisulphate of mercury or a similar amount of nitrate of mercury (mercury dissolved in nitric acid). By employing this method, the amalgamation of the zincs is maintained continuously after the first amalgamation, which must be accomplished by method 1 or 2.

4. In the Bunsen, Grove, or Fuller battery the amalgamation may be accomplished by placing a small quantity of mercury in the cells containing the zincs.

5. Place a little mercury in a saucer with some dilute sulphuric acid. Dip the zincs into dilute acid. Then with a little strip of zinc or galvanized iron touch the mercury under the acid and rub it on the zinc. This will transfer a little to the surface, and a few minutes' rubbing will make the zincs as bright as silver. A very small globule of mercury is enough for a single plate.

APPENDIX

FIFTEENTH REVISED EDITION

Additional Receipts
Tables of Weights and Measures
Chemical Synonyms

APPENDIX

Additional Receipts.

Aluminum.—A cubic inch of pure aluminum weighs approximately one tenth of a pound avoirdupois, being about one fourth the weight of an equal bulk of pure silver.

Pure aluminum can be rolled, drawn, spun, stamped, engraved, burnished, polished, and soldered, to the same extent and by the same processes as used on brass, with the following exceptions:

Annealing.—A very low and even temperature should be maintained in the muffle. Aluminum melts at about 1,300 degrees Fahrenheit—a very dark red. The inexperienced therefore cannot judge the proper annealing temperature by the eye alone, without danger of fusing the metal. When the metal has been heated enough to char the end of a pine stick, thus leaving a black mark in the wake of the stick as it is drawn across the metal, it is sufficiently annealed. The metal should then be withdrawn from the furnace and allowed to cool slowly in the air. For some work, such as stamping and drawing, it is sometimes better not to heat the metal so hot as to leave a dead black mark with the stick, but just enough to show a dark brown mark instead. Very thin sheets or wire can be annealed sufficiently for some purposes in boiling water.

Dipping and Pickling.—Remove the grease and dirt by dipping in benzine, to whiten aluminum, leaving on the surface a beautiful white mat; dip first in a strong hot solution of potash, then rinse in water and dip in undiluted nitric acid, 42 degrees. Then wash in water and dry as usual in hot sawdust.

Polishing.—Use fine white polishing composition or rouge, and a rag buff.

Burnishing.—Use a bloodstone or steel burnisher. For hand burnishing use either kerosene oil or a solution composed of two tablespoonfuls of ground borax dissolved in about a quart of hot water, with a few drops of ammonia added.

For lathe work the burnisher should wear upon the finger of his left hand a piece of Canton flannel, keeping it soaked with kerosene, and bringing it in contact with the metal, supplying a constant lubricant.

Very fine effects can be produced by first burnishing or polishing the metal, and then stamping it in polished dies, showing unpolished figures in relief.

Scratch-brushing.—Polish or burnish the surface, and then use a fine steel scratch-brush.

Soldering.—A special solder is necessary, for which see *Soldering*, page 527. Cleanse the metal from grease and dirt. Use for soldering fluid, Venetian turpentine. Place the solder upon the metal, with the Venetian turpentine, and heat gently in a blowpipe until the solder is melted. It will then be found to have fixed itself firmly to the aluminum.

Sand Castings.—Use open, but very fine sand, and bake the mould. Large feeding gates should be provided, and the mould should be well vented. Pour the metal quickly, at a temperature but little above the melting point. Use either Taylor's or Dixon's plumbago crucibles.

Milling, Planing and Turning.—Use plenty of oil to prevent the clogging of the tool and to make it cut smooth.

Plating with. See **Electro-metallurgy**, below.

Ammonia.—*Domestic Ammonia for Cleaning Purposes.*—Rub up soap and borax with water until dissolved, strain, and add the other ingredients.

1. Soft soap	1	oz.
Borax	2	drm.
Eau de cologne	½	oz.
Stronger water of ammonia	5½	oz.
Water enough to make	12	oz.
2. Sodium carbonate	20	oz.
Water of ammonia	48	oz.
Water	32	oz.

Mix. Allow to stand two or three days, and then decant the clear solution and bottle.

3. The following formulas yield a cloudy preparation:

Potassium carbonate	1	part.
Borax	1	part.
Green soap	1½	parts.
Strong water of ammonia	4	parts.
Distilled water	8	parts.

Heat the water and dissolve in it the soap and potassium carbonate; then add the borax, and, when cold, the stronger water of ammonia. The preparation may be perfumed with the oil of mirbane.

4. Ammonia water	1	gal.
Soft water	8	gal.
Yellow soap	4	lb.
Saltpeter	8	ozs.

Cut the yellow soap in shavings and dissolve in soft water by heating; add the saltpeter and stir well until dissolved; strain, let settle, skim off all soap suds, etc., add the ammonia, and bottle at once.

5. Rectified spirit	4	fl. oz.
Water	4	gals.
Oil rosemary	½	oz.
Oil citronella	3	drm.

Dissolve the oils in the spirit and add the water. Add 2 ounces fuller's earth, shake well and strain, then—

Ammonia water	2	gals.
White curd or soft soft soap	2	oz.

—*Pharmaceutical Era.*

Perfumed Ammonia Scouring Water.—Perfumed ammonia scouring water is prepared by mixing: Spirits of sal ammoniac, 160 parts; finely scraped soap, 30 parts; borax, 10 parts; cologne water, 15 parts; distilled water, enough

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to make up 460 parts of liquid.—*Neueste Erfindungen und Erfahrungen.*

Perfumed Toilet Ammonia.—The following is original and highly commended: Distilled water, 5 pts.; liq. ammonia forte, 2½ pts.; French rose water, 5 ozs.; soluble ess. of orange, 7 drms.; soluble ess. of lemon, 7 drms.; soluble ess. of neroli, 6 drms.; soluble ess. of bergamot, 2 drms.; soluble ess. of rosemary, 2 drms. Mix the essences with the distilled and rose water, and then add the ammonia.—*Practical Druggist.*

Annealing.—*Cast Iron.*—To anneal cast iron, heat it in a slow charcoal fire to a dull red heat; then cover it over about 2 inches with fine charcoal; then cover with ashes. Let it lie until cold. Hard cast iron can be softened enough in this way to be filed and drilled.

Steel.—More steel is injured, and sometimes spoiled, by over-annealing than in any other way. Steel over-heated in annealing will shrink badly when being hardened; besides, it takes the life out of it. It should never be heated above a low cherry red, and it should be a lower heat than it is when being hardened. It should be heated slowly, and given a uniform heat all over and through the piece. This it is difficult to do in long bars and in an ordinary furnace. The best way to heat a piece of steel, either for annealing or hardening, is in red hot, pure lead (says Mr. Pratt, of the well known firm of Pratt & Whitney). By this method it is done uniformly, and one can see the color all the time. The firm do some heating for annealing in this way, and simply cover up the piece in sawdust and let it cool there and get good results.

Ants, Remedy for.—Many ways of getting rid of ants have been suggested, but few work satisfactorily. The following, however, has stood the test very well: Lay on a plate, accessible to the insects, several slices of raw meat, exposing as great a surface as possible. Let these stand for some hours, and you will find them crowded with ants, as they greatly relish raw meat. Now throw the whole into fire or boiling water. Repeat the same process, if necessary, till you are no longer troubled.—*Science en Famille.*

Babbitt Metal.—"Genuine" babbitt is composed of a small quantity of copper added to tin and antimony. No lead is used, for the adjective "genuine" is applied especially to distinguish it from the cheaper grades containing lead.

There is considerable temptation to adulterate it with lead, owing to the difference in value of lead and tin; 1 lb. of lead added to 100 of "genuine" makes a gain of about 18 cents. The character of the alloy would not be greatly altered, but when the purchaser pays for the best he certainly has a right to expect it. Fortunately, it is easy to detect such adulteration; take a piece and use it for a pencil, if it makes a mark, then it contains lead, as a small amount of lead added to tin causes the latter to mark paper. The following proportions may be used in making this alloy:

1. Copper	4 lb.
Tin	8 lb.
Antimony	8 lb.

This forms the hardening, as it is called. First melt the copper, add the tin and afterward the antimony; remove from the fire and let cool down to a dull red heat, then add 16 lb. more tin to increase the fusibility of the hardening. This makes 32 lb. hard ening, add this to 64 lb. more tin—the proportions of tin to hardening thus being two to one. The additional tin should be melted separately in a kettle or suitable vessel, and the hardening added either in ingot form or direct from the furnace; in the latter case be sure the tin is all melted, otherwise an accident might occur by the hot metal from the furnace falling on the damp end of a projecting ingot.

To prevent loss by oxidation, the contents of the kettle should not be heated much above the melting point. In cases where a cheaper composition is desirable, the following can be recommended:

2. Genuine hardening	32 lb.
Tin	64 lb.
Lead	93 lb.

This forms a good alloy. Another one is:

3. Hardening	16 lb.
Tin	50 lb.
Antimony	20 lb.
Lead	80 lb.

In mixing this alloy first melt a portion of the lead, say 40 lb., in the kettle, or in a crucible in the furnace, bring to a dull red heat, add the antimony, in small pieces; when melted, add the balance of lead. Do not attempt to melt the antimony without the lead bath, as it is a volatile metal and there would be a loss from oxidation.

In making all alloys containing hardening, a furnace is necessary to melt the copper. The following mixtures contain no copper, and are fairly good compositions:

4. For hardening take:	
Lead	145 lb.
Tin	40 lb.
Antimony	20 lb.

Melt 145 lb. lead and 40 lb. tin and add 52 lb. hardening.

5. For hardening:	
Lead	48 lb.
Antimony	26 lb.

Add this amount to 152 lb. lead. The hardening is used in this merely to form a bath for the antimony, and any portion of 200 lb. lead may be taken. This is cheap and soft.

Another cheap composition is formed as follows, and is known as "hard lead":

6. Lead	80 lb.
Antimony	20 lb.

Hard lead is better metal than No. 5. It is largely used for lining car journal bearings. It may be improved by the addition of tin, as in the following:

Hard lead	100 lb.
Tin	100 lb.

This is given as an illustration. A great variety of alloys can be made by taking hard lead as a base and adding tin in varying quantities.—*C. Vickers in American Metal Worker.*

Baking Powder.—These are some formulas taken from a paper read before the Georgia Pharmaceutical Association several years ago by Dr. George F. Payne, of Atlanta. The figures are based upon the tartaric acid selling by the ton at 25 cents a pound, cream of tartar at 22½ cents, acid phosphate of lime at 7½ cents, dried alum at 4½ cents, starch at 2½ cents, and bicarbonate of soda at 3½ cents. That these powders should keep well, each ingredient should be first thoroughly dried by a gentle heat, and they should be kept securely closed in dry fruit jars, corked bottles or sealed cans.

1. Tartaric acid	1 lb.
Bicarbonate of soda	1 lb.
Starch (powdered)	½ lb.
Costs about 11¾ cents a pound.	

2. Cream of tartar	2 lb.
Bicarbonate of soda	1 lb.
Starch (powdered)	¾ lb.
Costs about 13½ cents a pound.	

3. Acid phosphate of lime	1½ lb.
Bicarbonate of soda	1 lb.
Starch (powdered)	1¼ lb.
Costs about 4¼ cents a pound.	

4. Acid phosphate of lime..... 2 lb.
Dried ammonia alum.. .... 2 lb.
Bicarbonate of soda... .... 3 lb.
Starch (powdered.)..... ..... 5 lb.
Costs about 4 cents a pound.

5. Dried ammonia alum..... 1 lb.
Bicarbonate of soda..... .... 1 lb.
Starch (powdered) .... 1 lb.
Costs about 3½ cents a pound.

To the above cost should be added the cost of the containers and the time consumed in doing the work. The ingredients, all finely powdered, should be first sifted separately, to get rid of all lumps, then the soda and starch should be well mixed together, and finally the acid ingredients should be added, and all thoroughly incorporated, either by rubbing together in a mortar or by sifting at least three times. Flour can be used in place of starch, and is considerably cheaper. A recipe is given for each variety of baking powder. The amount of starch can be increased in any of the recipes; the other ingredients being left the same.—*Pharmaceutical Era.*

Balenite.—A substitute for whalebone. It is composed of: Caoutchouc, 5 parts; burnt magnesia, 1 part; ruby shellac, 1 part; arsenic trisulphide, 1 part; sulphur, 1 part.

Barometers, Paper.—1. Copper chloride, 1 part; nickel oxide, 3 parts; cobalt chloride, 4 parts; gelatine, 80 parts; distilled water, 800 parts.

2. Cobalt chloride, 1 part; gelatine, 10 parts; distilled water, 100 parts.

3. Copper chloride, 1 part; gelatine, 10 parts; water, 100 parts.

Paper saturated with 1 becomes green in dry weather; with 2, blue; with 3, yellow. In wet weather the papers are colorless.—*National Druggist.*

See also **Storm Glass** below.

Battery Fluid.—1. Mercury bisulphate, 120 gr.; potassium bichromate, 2¼ oz.; commercial sulphuric acid, 3 fl. oz.; water, 16 fl. oz. In the water first dissolve the mercury bisulphate and then the bichromate; then add the sulphuric acid very carefully, stirring constantly with a glass rod. When cool, the solution is ready for use. The mercury keeps the zincs well amalgamated. Sometimes the mercury salt is omitted, and frequently sodium bichromate is substituted for the potassium bichromate.

2. Bottome's Battery Fluid.—This solution consists of chromic acid, 6 parts; water, 20 parts; potassium chlorate, ½ part; and sulphuric acid, 3½ parts (by weight). There is said to be no danger, provided the potassium chlorate be dissolved before the sulphuric acid be added. The addition of potassium chlorate to sodium bichromate gives it greater staying powers; but not so markedly as in the case of chromic acid, unless a large excess of sulphuric acid is used to neutralize both the sodium and potassium.

Batteries, Dry.—In the so-called dry batteries the exciting substance is a paste, instead of a fluid; moisture is necessary to cause the reaction. These pastes are generally secret preparations. One of the earlier "dry" batteries is that of Gassner. As described in "Carhart's Primary Batteries," the apparatus consists of a containing vessel of zinc, which forms the positive element; the negative one is a cylinder of carbon, and the space between is filled with a paste, the recipe for which is:

1. Oxide of zinc, 1 part; sal-ammoniac, 1 part; plaster, 3 parts; chloride of zinc, 1 part; water, 2 parts.

According to *The Electrical World*, the usual form of chloride of silver battery consists of a sealed cell containing a zinc electrode, the two being generally separated by some form of porous septum. Around the platinum or silver electrode is cast a quantity of silver chloride. This is melted and generally poured into moulds surrounding the metallic electrode. The exciting fluid is either a solution of ammonium chloride, caustic potassa or soda, or zinc sulphate. As ordinarily constructed, these cells contain a paste of the electrolyte, and are sealed up hermetically in glass or hard rubber receptacles:

2. Calcium chloride, crystallized, 30 parts; calcium chloride, granulated, 30 parts; ammonium sulphate, 15 parts; zinc sulphate, 25 parts.

The mixture is said to have proved valuable for electric conduits.—*Neueste Erfindungen und Erfahrungen.*

Beer, Ginger. See **Ginger.**

Bicycle Oil. See **Lubricants.**

Bicycle Tires, Cements for. See **Cements.**

Bicycles, Black Enamel for. See **Enameling.**

Blackings and Polishes for Boots and Shoes.—1. *Liquid Blacking.*—To one gallon rectified spirit is added 21 drachms blue aniline and 31 drachms Bismarck brown aniline, the solution of the last two being effected by agitation for eight to twelve hours. After the solution is completed the mass is allowed to settle, and the liquid portion is drawn off by spigots above the sediment and filtered if necessary. The alcohol is placed in the apparatus first, then the colors and the mixture agitated every hour for a space of ten or fifteen minutes. Of this liquid one-fourth gallon is added to 1 gallon of rectified spirit, and in this are dissolved 11 ounces of camphor, 16 ounces Venice turpentine, 36 ounces shellac. To 1 quart benzine add 3½ fluid ounces castor oil and 1⅛ fluid ounces boiled linseed oil. The two solutions are then united by agitation, but should not be allowed to stand over two days in any vessel of iron or zinc, as in the presence of the gums the colors will be decomposed.

2. Shellac, 50 grn.; Venice turpentine, 40 grn.; solid blue black "B," 15 grn., in a mixture of alcohol, 2 fl. oz., gasoline, 6 fl. drm.—*Pharmaceutical Era.*

3. Castile soap, white, 1 oz. av.; sandarac, 1 oz. av.; mastic, ½ oz. av.; Venice turpentine, 2 oz. av.; shellac, 3¼ oz. av.; aniline black "E," 1½ oz. av.; glycerine, 2 fl. oz.; water, 3 fl. oz.; alcohol, 24 fl. oz.

Dissolve the soap in the water, mixed with 7 fl. oz. alcohol; macerate in a warm place with frequent agitation, subsequently filtering through cotton. The mastic, sandarac, and Venice turpentine should be dissolved in 9 fl. oz. alcohol and the solution also filtered through cotton. Then dissolve the shellac and aniline in the remainder of the alcohol. Now mix the three solutions and add glycerine. The mixture should be dispensed in wide-mouth bottles, the corks being supplied with a wire which has a sponge attached to it.

4. Caoutchouc, 1 oz. av.; petroleum, 1 oz. av.; carbon disulphide, 1 fl. oz.; shellac, 4 oz. av.; lampblack, 2 oz. av.; oil of lavender, 1 fl. drm.; alcohol, 20 fl. oz.

Upon the caoutchouc, contained in a bottle, pour the carbon disulphide; cork well and let it stand a few days, or until the caoutchouc has become thoroughly gelatinized or partly dissolved; then add the petroleum, lavender oil, and alcohol, next the shellac in fine powder, and heat to about 50° C., taking care that as little as possible is lost by evaporation. When the substances are all dissolved and the liquid is tolerably clear, add the lampblack, and fill at once into small bottles.—*Bulletin of Pharmacy.*

Paste Shoe Blacking.—The following makes a brilliant and excellent blacking:

Ivory black, 40 parts; sulphuric acid, 10 parts; fish oil, 10 parts; sodium carbonate, crystallized, 18 parts; sugar or molasses, 20 parts; liquid glue, prepared as below, 20 parts; water, sufficient.

Soak 10 parts of good white glue in 40 parts of cold water for four hours, then melt with a gentle heat. Then for every 80 oz. of the liquid glue add 3 oz. of glycerine (or in the same proportion). Set aside. Dissolve the sodium carbonate in sufficient water to make a saturated solution in the cold (it will take about 3 parts of water at 60° F.), and set aside. Next, in an earthenware vessel moisten the ivory black with a very little water, stirring it about with a wooden stick, and add the sulphuric acid, agitating the mixture until a thick paste or dough is obtained. Next add the fish oil (any kind of animal, or even colza oil will answer, but it is best to avoid high-smelling oils), and incorporate by agitation, adding, a little at a time, sufficient of the saturated solution of sodium carbonate to cause effervescence, but not enough to liquefy the mass. Stir until effervescence ceases, then add the molasses or sugar, according as you want a soft, damp paste or a drier one, and, finally, add a little at a time, under constant stirring, sufficient of the glue solution to make the paste of the desired stickiness. The exact amount of the latter ingredient necessary must be learned by a little experience. It is, however, a most important item, as it gives the blacking a depth and brilliancy that it otherwise could not have (and in which most of the blackings on the market are sadly deficient). Besides this, it renders the blacking damp-proof, and, at the same time, keeps the leather soft and supple.—*National Druggist.*

Acid Free Shoe Blacking.—1. Dissolve 150 parts of wax and 15 of tallow in a boiling mixture of 200 parts linseed oil, 20 of litharge and 100 of molasses. Heat to 230° to 248° F., with an addition of 100 parts of lampblack. When cold dilute with 200 parts of linseed oil and mix with a solution of 5 parts of gum lac and 2 of aniline violet in 25 of alcohol.

2. Powdered nutgall, 50 grm.; rasped logwood, 30 grm.; water, 200 grm.; ferrous sulphate, 30 grm.; sirup, 200 grm.; shellac, 10 grm.; alcohol, 200 grm.

Boil together for two hours the nutgall, logwood and water; strain while hot, add the sirup and iron; boil the liquid until it begins to thicken, then add the shellac dissolved in the alcohol.

3. Waterproof Boot Polish.—Beeswax, 18 parts; spermaceti, 6 parts; oil turpentine, 66 parts; asphalt varnish, 5 parts; powdered borax, 1 part; lampblack, 5 parts; Prussian blue, 2 parts; nitrobenzol, 1 part.

Melt the wax, add the powdered borax, and stir till a kind of jelly has formed. In another pan melt the spermaceti, add the asphalt varnish, previously mixed with oil of turpentine, stir well, and add to the wax. Lastly add the color, previously rubbed smooth, with a little of the mass. Perfume with nitrobenzol and pour into boxes. Apply in small quantities with a cloth and brush. Use only once a week.—*Pharmaceutical Era.*

Patent Leather Polish.—1. Yellow wax, 6 drm.; olive oil, 2 oz.; oil of turpentine, ½ oz.; oil of lavender, ½ oz.

Melt the wax and olive oil together, add the turpentine, and when nearly cool the oil of lavender. This is said to restore the flexibility of patent leather which has become hardened and to renew its gloss to a certain extent.

2. Yellow wax (or ceresin), 3 oz.; spermaceti, 1 oz.; turpentine oil, 11 oz.; asphaltum varnish, 1 oz.; borax, 80 grn.; Frankfort black, 1 oz.; Prussian blue, ⅜ oz.

Melt the wax and stir well with the borax; melt the spermaceti separately, adding to it the turpentine in which has previously been dissolved the varnish; stir the second mixture into the wax and add the colors.

As a coloring matter where the leather has been scratched the following may be of service, applied, of course, before the polish:

Gum arabic, 4 oz.; molasses, 1 oz.; nutgall ink, 8 oz.; vinegar, ½ oz.; sweet oil, ½ oz.; alcohol, 1 oz.; lampblack, 1 drm.—*Druggist's Circular.*

Tan and Russet Shoes, Polish for.—1. Annatto, 1 oz.; gamboge, 1 oz.; acacia, 1 oz.; catechu, 2 oz.; hydrochloric acid, 2 oz.; water, enough to make 40 oz.

Rub the annatto and gamboge with the acid and a portion of the water, and add this to the remainder of the water, with which has been incorporated the catechu and acacia.

2. Oil of turpentine, 3 oz.; dark yellow wax, 1 oz.; palm oil, 1 oz.; oil of mirbane, 15 min.

3. Yellow wax, 6 oz.; linseed oil, 10 oz.; spirits of turpentine, 30 oz.

Dissolve in a closed vessel by means of a water bath, and add

Soap ..... 4 oz.

previously dissolved in

Water ..... 2 pts.

Stir until cold. With each ounce of the cream thus obtained mix thoroughly

Nankin brown..... 5 gr.

dissolved in

Rectified spirit..... ½ drm.

The resulting polish is applied to the leather with a rag, allowed to dry, and then lightly polished with a soft cloth.—*Pharmaceutical Era.*

4. The Liquid—

Beeswax, yellow.....	2 oz.
Linseed oil	3 oz.
Oil turpentine.....	10 oz.

Dissolve by means of a water bath in a closed vessel and add—

Hard yellow soap, finely shaved.....	1¼ oz.

Dissolve soap with the aid of heat in 14 oz. of water and add the solution to the solution of yellow wax and linseed oil formed in the first instance. A nice russet brown color may be imparted to this shoe polish by incorporating about 3 gr. of Bismarck brown to each ounce of the polish.

The Paste—

Beeswax, yellow.....	1 oz.
Palm oil.....	1 oz.
Oil turpentine.....	3 oz.

Melt on a water bath.

5. Soft soap, 1 oz.; linseed oil, raw, 1½ oz.; annatto, 4 oz.; yellow wax, 1½ oz.; gum turpentine, 4 oz.; water, 4 oz. Dissolve the soap in the water and add the annatto. Melt the wax in the linseed oil and turpentine, and gradually add the soap solution, stirring until cold.

6. Yellow wax, 1 oz.; palm oil, 1 oz.; oil turpentine, 3 oz.; oil mirbane, 15 drops.

Make into a paste. The color may be heightened if not of the right shade by the judicious use of butter coloring made from annatto.

7. Soft soap.....	2 oz. av.
Linseed oil	3 fl. oz.
Annatto solution (in oil).....	8 fl. oz.
Beeswax.....	3 oz. av.
Gum turpentine.....	8 oz. av.
Water	8 fl. oz.

Dissolve the soap in the water and add the annatto; melt the wax in the oil and turpentine and gradually stir in the soap solution, stirring until cold.—*Bulletin of Pharmacy.*

8. Water, 162·5 parts; borax, 5 parts; aniline "leather brown," water soluble, 1 part; orange shellac, 15 parts; ammonia water, 1·25 parts; distilled water, 1·25 parts.

Bring the water to a boil, add the borax and dissolve, and to the solution add, a small quantity at a time, the aniline color (which should be free from iron). When the water is boiling actively add the shellac, a little at a time, stirring vigorously while doing so. Let boil for ten or fifteen minutes, pour off into a clean vessel, and allow the mixture to cool

down. Mix the ammonia and water, and when the mass is quite cool, stir the mixture well in. Other colors (water soluble) may be used instead of the leather brown, a little experimenting showing the amount to be employed.—*Pharmaceutical Era.*

Blacking and Polishes for Stoves.—Graphite (often misnamed black-lead) is the foundation ingredient in a stove polish. Lampblack is frequently added to deepen the color, but the latter form of carbon is of course more readily burned off than the former.

The powder variety of stove polish is merely purified and ground graphite, with or without the addition of lampblack, which is applied to the stove by being first mixed with a little water.

The paste is made by the addition of glycerine or paraffine oil to the powder.

The following formula gives a liquid stove blacking:

1. Graphite in fine powder, 1 lb.; lampblack, 1 oz.; rosin, 4 oz.; turpentine, 1 gal.

This form may be esteemed a convenience by some, but the rosin will, of course, give rise to some disagreeable odor on first heating the stove, after the liquid is applied.

The mixture must be kept well shaken while in use, and must not be applied when there is a fire or light near on account of the inflammability of the vapor.

The solid cakes of polish are said to be made by subjecting the powdered graphite, mixed with spirit of turpentine, to great pressure. It has to be reduced to powder and mixed with water before being applied.

Any of them has to be well rubbed with a brush after application to give a handsome polish.—*Druggist's Circular.*

2. A correspondent of *The Pharmaceutical Era* submits the following formula for a preparation which he says his company advertises as a "dustless paste stove polish:"

Animal charcoal, 8 parts; blacklead, 8 parts; molasses, 4 parts; sulphuric acid, 2 parts; hydrochloric acid, 1 part; water, enough to make a paste.

He says he allows the acids to act on the charcoal and molasses for twenty-four hours, after which the graphite is added with enough water to form a paste. He says that the trouble with this paste is that "it forms a layer on the cloth when applied, and this layer in contact with a warm stove falls as dust to the floor."

The French stove polish which is used for blackening and polishing iron stoves is produced in the following manner:

3. Turpentine oil, French or American, 23·0 kilos.; American lampblack, 3·0 kilos.; prime black, fat, finely elutriated graphite, 2·5 kilos.

4. Ceresine, 3·0 kilos.; carnauba wax, 0·5 kilo.

Melt the ceresine and carnauba wax in a tinned or enameled kettle over a moderate fire and add mixture 3, previously stirred cold, to the fusion, 4, but only at a distance from the fire, with stirring. Pour this mixture through a fine metal sieve into a second vessel, and next, for a more intimate mixture, from one kettle into another until it begins to thicken, and only then fill into tin cans. If the paste should have become a little too cold during the filling of the tins, so that it interferes with the pouring, all that is necessary is to put the vessel into a larger one containing boiling water, whereby it is rendered more liquid again.—*Seifensieder Zeitung.*

5. Ceresine	120 grm.
Japanese vegetable wax	100 grm.
Turpentine oil	1,000 grm.
Fine lampblack	120 grm.
Graphite	100 grm.

Unite ceresine and wax by melting, add to the half cooled, liquid mass the lampblack and graphite ground in the oil of turpentine and stir until completely cool.—*Farben Zeitung.*

6. For a liquid stove polish try the following:

Copperas	10 parts.
Boneblack	5 parts.
Graphite, in powder	5 parts.

Water sufficient to make a paste. The addition of a small amount of alum to this is said to improve it.

Another cheaper formula is as follows:

Soap, common yellow	10 parts.
Resin, in powder	5 parts.
Water, sufficient	

Boneblack or plumbago, sufficient. Mix the resin and the soap (the latter finely shaved), add 40 parts of boiling water and heat until a homogeneous mixture is obtained.

Stir in the blacking material and remove from the fire. Test a small portion, and then dilute with boiling water to suit.

7. If cost is no object, the following will prove all that can be desired:

Bayberry wax	10 parts.
Plumbago, in fine powder	200 parts.
Coal oil, sufficient.	

Melt the mineral wax with a portion of the oil over a water bath, and pour the product into the rest of the oil, stirring well. Grind up the plumbago with the product, adding a little at a time, until you arrive at the desired consistency.—*National Druggist.*

Paste Stove Polish.—

8. Plumbago	2 lb.
Water	8 oz.
Turpentine	8 oz.
Sugar	2 oz.

Knead thoroughly and keep in tin boxes. Apply with a brush.

Here are several other formulas:

9. Mix 2 parts of black-lead, 4 parts of copperas, and 2 parts of boneblack, with water, so as to form a creamy paste. This is an excellent polish, as the copperas produces a jet black enamel, causing the black lead to adhere to the iron.

10. Moisten plumbago with turpentine in which resin has been dissolved, to make it adhesive, and subject it to strong pressure in appropriate moulds.—*Pharmaceutical Era.*

Bluing.—*Ball Blue.*—The ball sold for laundry use consists usually, if not always, of ultramarine. The balls are formed by compression, starch or some other excipient of like character being added to render the mass cohesive. Blocks of blue can, of course, be made by the same process. The manufacturers of ultramarine prepare balls and cubes of the pigment on a large scale, and it does not seem likely that there would be a sufficient margin of profit to justify the making of them in a small way from the powdered pigment. Careful experiments, however, would be necessary to positively determine this. Ultramarine is of many qualities, and it may be expected that the balls will vary also in the amount of "filling" according to the price at which they are to be sold.

As an illustration of the "filling" or diluting process, and a suggestion for experiment, we reprint the following:

Ultramarine	6 oz.
Sodium carbonate	4 oz.
Glucose	1 oz.
Water, a sufficient quantity.	

Make a thick paste, roll into sheets, and cut into tablets.

The balls in bulk can be obtained only in large packages of the manufacturers, say barrels of 200 lb.; but put up in 1 lb. boxes they can be bought in cases as small as 28 lb.

Where there is a trade for small packages there would apparently be a fair margin of

profit in buying 28 lb. lots and putting them up in 1 oz. and 2 oz. cartons.

The term bag bluing simply indicates a solid blue; which, whatever its composition, is used by placing in a little bag, immersing this in water, and pressing out the liquid into the water to be blued.—*Druggist's Circular.*

Soluble Wash Bluing.—The following makes one of the best wash bluings known, and when prepared in quantity is very cheap: Dissolve 217 parts of potassium ferrocyanide in 750 parts of distilled water, and to the solution add sufficient water to make in all 1,000 parts. In another vessel dissolve 100 parts of ferric chloride in sufficient distilled water, and bring the solution up to 1,000 parts as before. Make a cold saturated solution of sodium sulphate in distilled water, and of the solution add 2,000 parts to each of the two iron solutions (making 3,000 parts of each). Now add the chloride solution to the ferrocyanide little by little, under constant stirring. After the last of the ferric chloride is added, continue the stirring for some time. Filter off the liquid and wash the residue on the filter with distilled water until the wash water comes off a deep blue color. After washing, spread the mass out to dry, either at ordinary temperature or by artificial heat. When dry, a lump of this substance, which is soluble Prussian-blue, breaks with a fine bronze-colored fracture. It is completely and easily soluble in water, hot or cold. With the addition of a little mucilage it makes, when dissolved in water, a beautiful blue ink, and may be also used for hand-stamp ink. As a laundry bluing it leaves nothing to be desired either in cost or quality.—*National Druggist.*

Wash Bluing Tablets.—

Tablets of the First Quality.

Best (superfine) ultramarine	40 parts.
Ordinary ultramarine	20 parts.
Sodium carbonate	40 parts.
Glucose	12 parts.

Mix and make into tablets as directed further on.

Inferior Tablets.

Ultramarine, second quality	50 parts.
Sodium carbonate	50 parts.
Glucose	12 parts.

Still cheaper bluing may be made by using less ultramarine and more sodium carbonate, or by using cheaper coloring material (the so-called *blau-erde*), but the above will answer for the best and second-class trade.

The glucose is diluted with water to 16° Baume, and, if the tablets are to be made quite hard, either gum arabic, gelatine, or dextrine should be added. As tablets made without any addition very easily contract moisture, an admixture of one or the other of the substances named is recommended. It is possible that cylinders might prove more acceptable than tablets. These should be wrapped in linen, or put into linen bags, so that in use the bag can be hung up in the water, thus giving a solution that will not need straining under any circumstances.—*Drogisten Zeitung.*

Bluing on Steel, to Remove.—For removing the blue from steel, so as to leave it as clean as before coloring, try acetic acid, or solution of tin chloride (stannous chloride).

Boiler Scale, Prevention of.—In order to prevent the formation of boiler scale, a process is described which is employed considerably of late and consists in the use of chromates.

The lime contained in the feed water either as bicarbonate or as sulphate is precipitated in the shape of a light mud, but the walls of the boiler remain perfectly bright without being attacked in any manner. While under ordinary atmospheric pressure calcium chromate in solution is precipitated out by soda or Glauber's salt as calcium carbonate or as calcium sulphate, the latter is separated under higher pressure by chromates as calcium chromate. An excess of chromates or chromic acid does not exercise any deleterious action upon the metal, nor upon the materials used for packing. Experiments conducted before the addition of chromates to the feed water revealed after a period of two months a layer 10 to 12 mm. thick of very hard scale in the boiler, which was very difficult to remove and consisted of gypsum and lime subcarbonate. Upon employment of chromate, however, which is best employed as alkaline chromate in slight excess, only a thin slime was found after a four or five weeks' working period, which was already expelled by the exhaustion of the steam. The boiler itself was perfectly bright, and the walls were not attacked or corroded in the least. By the slight admixture of chromates, 2 lb. are sufficient for a small boiler for weeks; no injurious ingredients are carried in by the wet steam, the injection water, on the contrary, having been found to be chemically pure.—*Allgemeine Brauer und Hopfen Zeitung.*

Brass, Pickle for Dipping.—To improve the appearance of brass, tombac and copper goods, they are usually dipped. For this purpose they are first immersed in diluted oil of vitriol (brown sulphuric acid), proportion 1 to 10; next in a mixture of 10 grm. of red tartar, 10 grm. of cooking salt, ¼ liter of sulphuric acid as well as ¼ liter of aqua fortis (only for a moment), rinsing off well in water and drying in sawdust. For obtaining a handsome matt gold color, $\frac{1}{10}$ part of zinc vitriol (zinc sulphate) is still added to the pickle.—*Deutsche Goldschmiede Zeitung.*

Brass, to Color. See **Coloring.**

Brazing, Borax for.—Probably for some kinds of work borax will never be improved upon for a flux, but for some other varieties of brazing borax does not completely fill the bill, as, for example, when brazing work which must be filed and cannot be ground. Then the borax will leave a very hard skin, which destroys many a file before it is fully removed. For this kind of work some mechanics like to use boracic acid, putting it on with a brush or swab. The hard skin is thinner and comes off easier when the acid solution is used, but the difference lies mostly in the fact that not so much of the flux is used when the solution is employed. The usual way is to pound up a lot of lump borax in a lead melter's ladle or the hollow of a blacksmith's sow. Some of this usually very coarse powder is placed on the work with a flat bit of iron. Too much borax for the purpose is necessarily used in this manner, and the excess goes to make up the hard skin which dulls the files. When the acid is used, the same effect is secured as when the solid borax is applied, but not one-tenth the amount is used, and that is applied just where it is needed. If for any reason the foreman insists upon borax being used, make that official procure a coffee mill and have all the borax ground very fine. Then a little of the dust powder may be rubbed or dusted on where the joint is to be made, and the braze may be made without having a lot of oxide and slag piled up around the work.

Bubbles.—*Film Mixtures from Various Sources.*—For soap bubble solution the best material is pure oleate of soda. Oleic acid as sold in the shops is far from reliable, containing one or more other fatty acids, such as stearic acid. To make the pure acid, 2 oz. of pure soap (almond oil is the best, but Castile will answer) are dissolved in 20 oz. of boiling water. One oz. of sulphuric acid, previously diluted with 2 oz. water and allowed to cool, is added. The fatty acids rise to the surface in an oily layer. The water is siphoned off, and they are washed three times with boiling wa-

ter. The mass is allowed to cool, and is removed from the surface of the water, where it floats. It is weighed, mixed with half its weight of litharge, and heated (212°–225° F.) until complete combination is effected. This may be known by the cessation of any evolution of bubbles from the mass. The resulting lead plaster is allowed to stand mixed with 10 to 15 times its weight of ether in a tightly corked bottle until completely disintegrated. Then it is filtered, and to the filtrate hydrochloric acid is added as long as any lead is precipitated. The ethereal solution is poured off, and the ether recovered by distillation, leaving pure oleic acid. Two fl. drm. of the acid is added to somewhat less than 1 pt. of boiling water, and solution of caustic soda very carefully added, drop by drop, until complete solution of the acid is effected, very carefully avoiding an excess of soda, and after cooling, water is added to make it measure just 1 pt. A standard soap solution is thus obtained. To this add half its bulk of the best glycerine (Scheering & Glatz's, or Price's). Shake long and well, and the mixture is ready for use. For further information see *Scientific American Supplement* No. 654.

Butter Coloring, Odorless.—The following is accounted a formula that yields a satisfactory odorless butter coloring:

Annatto	½ oz.
Sodium bicarbonate	1½ oz.
Sugar	8 oz.
Potassium nitrate	8 oz.

Soften the annatto with about 2 oz. water, using the heat of a water bath; stir in about 2 oz. of the sodium bicarbonate, evaporate to dryness, and mix with the remainder of the soda and the other ingredients.

MacEwan, in his "Pharmaceutical Formulas," states that vegetable annatto is being replaced by aniline orange, the following being recommended as a popular coloring:

Oil-soluble aniline orange	1 oz.
Olive oil	160 fl. oz.

Dissolve the color in the oil by gentle warming. Cotton-seed oil may be used in place of olive oil. A teaspoonful of the coloring is sufficient for 10 gal. of cream.—*American Druggist.*

Butter Preserving Paper. See **Paper.**

Calcium Sulphide, Luminous.—Calcium sulphide as used in the manufacture of luminous paint may be prepared upon the small scale by the following process: Boil for one hour 2¼ oz. of caustic lime, recently prepared by calcining clean white shells at a strong red heat, with 1 oz. sulphur and 1 qt. soft water. Set aside in a covered vessel for a few days; then pour off the liquid, collect the clear orange-colored crystals which have deposited, and let them drain and dry on bibulous paper. Place the dried sulphide in a clean graphite crucible provided with a cover. Heat for one-half hour at a temperature just short of redness, then quickly for about fifteen minutes at a white heat. Remove cover and pack in clay until perfectly cold. A small quantity of pure calcium fluoride is added to the sulphide before heating it. It may be mixed with alcoholic copal varnish. Sulphides of barium and strontium also give phosphorescent powders when duly heated. Each sulphide has a predominant color, but the temperature to which it is heated has a modifying effect on the color. Calcine in a covered crucible, along with powdered charcoal, sulphate of lime, sulphate of barium, or sulphate of strontia; there is produced in each case a grayish white powder, which, after exposure to strong light (either sunlight or magnesium light), will be phosphorescent, the color depending on the sulphate used and the degree of heat employed.—*Pharmaceutical Era.*

Carbon Paper. See **Paper.**

Carbon Rods and Plates.—Carbon rods and plates of the finest quality can be made economically only by the use of expensive machinery and apparatus, such as pulverizing mills, hydraulic presses, and retorts or ovens; but the amateur, without a great deal of trouble, and with very little expense, can make carbon plates and rods which will answer a good purpose. The materials required are coke, wheat flour, molasses or sirup and water. The tools consist of a few moulds, a trowel or its equivalent for forcing the carbon mixture into flat moulds, tubes to be used as moulds for carbon rods, and ramrods for condensing the material in the tubes and forcing it out, and an iron mortar or some other device for reducing the coke to powder. Clean pieces of coke should be selected for this purpose, and such as contain no volatile matters are preferred. The coke is pulverized and passed through a fine sieve. It is then thoroughly mixed with one-sixth to one-eighth its bulk of wheat flour, both being in a dry state. The mixture is moistened with water (or water with a small percentage of molasses added) sufficiently to render it thoroughly damp throughout, but not wet. It should now be allowed to stand for two or three hours in a closed vessel, to prevent the evaporation of the water. At the end of this time the mixture may be pressed into moulds of any desired form, then removed from the moulds and dried, slowly at first, afterward rapidly, in an ordinary oven at a high temperature. When the plates or rods thus formed are thoroughly dried, they are packed in an iron box, or, if they are small, in a crucible, and completely surrounded by coke dust to exclude air and to prevent the combustion of the plates or rods during the carbonizing process. The box or crucible must be closed by a non-combustible cover and placed in a furnace or range fire in such a way as to cause it to be heated gradually to a red heat. After the box becomes heated to the required degree, it is maintained at that temperature for an hour or so, after which it is removed from the fire and allowed to cool before being opened. The rods or plates are then boiled for half an hour in this sirup or in molasses diluted with a little water. They are again baked in an ordinary oven and afterward carbonized in the manner already described. This latter process of boiling in sirup and recarbonizing is repeated until the required density is secured. As some gases are given off during carbonization, it is necessary to leave the box or crucible unsealed to allow these gases to escape.

Catsups. See **Pickles, etc.**

Celery Compound.—Celery (seed, ground), 25 parts; cocoa leaves (ground), 25 parts; black haw (ground), 25 parts; hyoscyamus leaves (ground), 12·5 parts; podophyllum (powdered), 10 parts; orange peel (ground), 6 parts; sugar (granulated), 100 parts; alcohol, 150 parts; water, q. s. add 400 parts.

Mix the alcohol with 150 parts of water and macerate drugs for 24 hours; pack in percolator and pour on menstruum till 340 parts is obtained; dissolve sugar in it and strain.—*Bulletin of Pharmacy.*

Cellars.—*Remedy for Damp.*—Take old preserve cans and put therein calcium chloride, a pound of this salt sufficing for a large cellar. The same attracts the water from the air, which collects in the cans. This, however, is not poured away, but is evaporated on a strong fire, whereby the salt crystallizes again and becomes fit for renewed use. Especially for potato cellars this process is very serviceable, since the sprouting of the potatoes, though not entirely prevented, is considerably retarded thereby.—*Maler Zeitung.*

Extermination of Mould in Cellars.—Unslaked lime is best suited for this purpose. Same is blown, in the shape of a fine powder, on the walls of the cellar and into the joints

and crevices by means of the bellows, or else thrown on with the hand. The walls must be damp; dry walls have to be well moistened previously. The lime slakes with the adhering water and kills all organisms. On the day following the walls are washed off, and, as experience has proved, the cellar will remain free from mould for at least two years.

Cements.—*Bicycle Rim Cement.*—A good thick shellac varnish with which a small amount of castor oil has been mixed will be found a very excellent bicycle rim cement. The formula recommended by Edel is as follows:

1. Shellac..... 1 lb.
   Alcohol..... 1 pt.

Mix and dissolve, then add

Castor oil..... ½ oz.

The castor oil prevents the cement from becoming hard and brittle.

A cement used to fasten bicycle tires may be made by melting together at a gentle heat equal parts of gutta percha and asphalt. Apply hot. Sometimes a small quantity each of sulphur and red lead are added (about 1 part of each to 20 parts of cement).—*Pharmaceutical Era.*

Shellac, 2 oz. av.; gutta percha, 2 oz. av.; red lead, 90 grn.; sulphur, 90 grn. Melt the shellac and gutta percha and add, with constant stirring, the red lead and sulphur, melted. Use while hot.

Cement for Bicycle Tires.—1. Isinglass, ½ oz. av.; gutta percha, ½ oz. av.; caoutchouc, 1 oz. av.; carbon disulphide, 4 fl. oz. Mix and dissolve.

2. Caoutchouc, 2 oz. av.; resin, 140 grn.; shellac, 100 grn. Carbon disulphide, a sufficient quantity to dissolve the other ingredients.

3. Crude rubber, ¼ oz.; carbon disulphide, 4 oz. Macerate 24 hours, and then add a solution of resin, 1 oz.; beeswax, ¼ oz., carbon disulphide, 4 oz.

Tire Cement containing no Carbon Bisulphide.—

A

4. Caoutchouc, fine shreds..... 1 oz.
   Chloroform..... 20 oz.

B

Caoutchouc, fine shreds..... 1 oz.
Resin..... 3 drm.
Venice turpentine..... 90 grn.
Oil turpentine..... 4 fl. oz.

For the solution B, the rubber is shaved into small pieces and melted with the resin; the Venice turpentine is then added, and all is dissolved in the oil of turpentine. The two solutions, A and B, are then mixed.

5. India rubber..... 15 grn.
   Chloroform..... 2 fl. oz.
   Mastic..... ½ oz.

Mix the India rubber and chloroform together, and when dissolved the mastic is added in powder. It is then allowed to stand for a week or two before using.

Cement, Puncture.—A recently patented preparation for the automatic repairing of punctures in bicycle tires consists of glycerine holding gelatinous silica or aluminum hydrate in suspension. Three volumes of glycerine are mixed with one volume of liquid water glass, and an acid in stirred in. The resulting jelly is diluted with 3 additional volumes of glycerine, and from 4 to 6 oz. of this fluid are placed in each tire. In case of puncture, the internal pressure of the air forces the fluid into the hole, which it closes.

Cementing Celluloid and Hard Rubber Articles.—Celluloid articles can be mended by making a mixture composed of 3 parts of alcohol and 4 parts of ether. The mixture should be kept in a well-corked bottle, and when celluloid articles are to be mended the broken surfaces are painted over with the alcohol and ether mixture until the surfaces soften; then press together and bind and allow to dry for at least twenty-four hours. Another cement for celluloid: Dissolve 1 part of gum camphor in 4 parts of alcohol; dissolve an equal weight of shellac in such strong camphor solution. The cement is applied warm and the parts united must not be disturbed until the cement is hard. Hard rubber articles are never mended to form a strong joint. The following is said to be the best cement for the purpose known: Melt together equal parts of gutta percha and real asphaltum. The cement is applied hot, and the broken surfaces pressed together and held in place while cooling.

Cementing Glass to Metal.—To glue glass to metal use the paste made by boiling together: Resin, 20 parts; soda, 6 parts; potassium silicate, 2 or 3 parts; water, 22 parts.

A froth is obtained. This should be skimmed off and 50 parts of it mixed with 80 parts of plaster of Paris (gypsum).—*La Science en Famille.*

Cloth, Cement for.—Use thin sheet gutta percha, which can be purchased of the manufacturers, especially for tailors' use. Place a piece of the tissue between the layers of cloth to be cemented and press with a hot iron. This causes the cloth to firmly adhere on account of the melting of the gutta percha.

Glass and Porcelain, Cement for.—Take 1 oz. of Russian isinglass, cut in small pieces, and bruise well; then add 6 oz. of warm water, and leave it in a warm place from thirty-four to forty-eight hours. Evaporate the resulting solution to about 3 oz. Next dissolve ½ oz. of mastic in 4 oz. of alcohol, and add the mastic solution to the isinglass in small quantities at a time, continuing the heat and stirring well. While still hot strain the liquid through muslin.

Photographs on Glass, to Mount.—According to the *Werkstatt*, clean the inner hollow side of the glass thoroughly, pour on gelatine dissolved in boiling water, lay the picture on and pour on gelatine again, so that everything swims. Then neatly remove what is superfluous, so that no blisters result, and allow to dry. The following recipe is said to be still better: Gelatine, 16 parts (weight); glycerine, 1 part (weight); water, 32 parts (weight); methylic alcohol, 12 parts (weight). The mixture is prepared by causing the gelatine to swell up in water, then dissolving it with the use of moderate heat, adding the glycerine, stirring thoroughly and pouring the whole in a thin stream into the alcohol.

Chewing Gum.—The manufacture of chewing gum is by no means the simple operation that it seems upon examination of the formula. Considerable experience in manipulation is necessary to success, and the published formulas can at best serve as a guide rather than as something to be absolutely and blindly followed. Thus, if the mass is either too hard or soft, change the proportions until it is right. Often you will find that different purchases of the same article will vary in their characteristics when worked up. Some manufacturers add a little paraffin or wax to harden the mass, but the most successful attribute their success to the employment of the most approved machinery and greatest attention to details. The working formulas and the processes of these manufacturers are guarded as trade secrets.

1. *Tolu Chewing Gum.*—Chicle, 3½ lb.; paraffin wax, 1 lb.; tolu balsam, 2 oz.; Peru balsam, 1 oz.

Dissolve the gum in as much water as it will take up, melt the paraffin, and mix all together. Now take:

Sugar, finely granulated, 10 lb.; glucose, 4 lb.; water, 3 pts.

Put the sugar and glucose into the water, dissolve and boil them up to "crack" degree (confectioners' term), pour the sirup over the

oil slab, and turn into it sufficient of the above gum mixture to make it tough and plastic, adding any of the following flavors if desired: Cinnamon, chocolate, sandal wood, myrrh, galangal, ginger or cardamom.—*Pharmaceutical Era.*

2. Chicle, 3¾ lb.; white wax, 1 lb.; sugar, 10 lb.; glucose, 2 lb.; water, 3 pt.; balsam Peru, 1 oz.; flavoring, a sufficient quantity.—*American Druggist.*

A somewhat different and more simple formula, taken from *The New Idea*, is as follows:

3. Tolu balsam, 4 oz.; benzoin, 1 oz.; white wax, 1 oz.; paraffin, 1 oz.; sugar, powdered, 1 oz. Melt together, mix well, and roll into sticks.

The following formulæ all yield excellent results:

4. White wax, 1 part; paraffin, 1 part; balsam of tolu, 4 parts; benzoin, 1 part; powdered sugar, 1 part; flavoring matter sufficient.

Melt the gums, etc., together, and when fluid stir in the sugar and flavoring matter (any of the essential oils). When cool enough, roll into sticks or cut into dice.

5. Yellow wax, 10 parts; balsam of tolu, 2 parts; balsam of Peru, 1 part; American thus, 15 parts; Venice turpentine, 20 parts.

Melt together and add, in fine powder, the following:

6. Cinnamon, 6 parts; chocolate (not sweet), 10 parts; red sandalwood, 2 parts; ginger, 1 part; sugar, 2 parts.

Mix well and pour out on a slab. When cool enough, cut into suitable pieces. This is very fine.

7. Gum chicle, 56 parts; paraffin, hard, 15 parts; balsam of tolu, 2 parts; balsam of Peru, 2 parts; sugar, granulated, fine, 160 parts; glucose, 64 parts; water, a sufficient quantity.

Soak the chicle in water until it absorbs all that it will take up. Melt the paraffin and balsams together and add the swelled chicle. In the meantime, mix the sugar and glucose with 50 parts of water and boil together until a little of the liquid, withdrawn on the end of a stick, and quickly dipped into a glass of cold water, snaps between the fingers on an attempt to bend it (what is called the "crack," or eighth degree, of candy boiling by confectioners). When this is reached, quickly remove from the fire and pour out on a large marble slab, the surface of which has been previously greased with butter or good sweet oil. As soon as the sirup is spread, add to it, a little at a time, carefully working in, the melted mixture of gums, paraffin, etc., until a portion of the mixture tested is found to have the proper degree of toughness. The flavoring (which consists of the essential oils, such as wintergreen, cinnamon, clove, sandalwood, etc., or any other substance that you may desire) should be well incorporated with the paraffin and gum mixture before adding to the sirup. These are the methods of procedure, and read easily enough, but you will find that it will pay you to employ an expert confectioner to carry them out. Sugar boiling, the carrying it to just the right degree, is an art in itself. You will need a large, smooth slab of marble, several inches thick, on which to do the mixing.—*National Druggist.*

8. *Spruce Chewing Gum.*—Spruce gum, 20 parts; chicle, 20 parts; sugar, powdered, 60 parts.

Melt the gum separately, mix while hot, and immediately add the sugar, a small portion at a time, kneading it thoroughly on a hot slab. When completely incorporated remove to a cold slab, previously dusted with powdered sugar, roll out at once into sheets and cut into sticks. Any desired flavor or color may be added to or incorporated with the sugar.

Cholera Cure, "The Sun."—During the prevalence of cholera in New York many years ago, *The Sun* published a formula which has since gone under the name of "*The Sun* chlorea mixture or cholera cure," though it was an old and well-known prescription among East India medical officers, *not*, however, for cholera, but in cramps, cholera morbus, acute diarrhœa, etc., long before *The Sun* was founded. It is as follows:

Tincture capsicum, 1 part; tincture opium, 1 part; tincture rhubarb, 1 part; spirits peppermint, 1 part; spirits camphor, 1 part.

Mix. Dose, 15 to 30 drops.—*National Druggist.*

Chow-Chow.—Curry powder, 4 oz.; mustard powder, 6 oz.; ginger, powdered, 3 oz.; turmeric, 2 oz.; cayenne pepper, 2 drm.; black pepper 2 drm.; coriander, 1 drm.; allspice, 1 drm.; mace, 30 grm.; thyme, 30 grm.; savory, 30 grm.; celery seed, in powder, 2 drm.; cider or wine vinegar, 2 gal.

Mix all together, and let simmer over a slow fire for three hours. The pickles should be scalded or slightly parboiled with boiling salt water, and the spiced vinegar poured over them while still warm.—*National Druggist.*

Cider.—*Artificial.*—The following, when properly prepared, makes a passable substitute for cider, and a very pleasant drink:

Catechu, powdered, 3 parts; alum, powdered, 5 parts; honey, 640 parts; water, 12,800 parts; yeast, 32 parts.

Dissolve the catechu, alum and honey in the water, add the yeast, and put in some warm place to ferment. Fermentation should be carried on in the manner and under the precautions so frequently described in this journal (i. e., the container should be filled to the square opening, made by sawing out five or six inches of the center of a stave, and the spume skimmed off daily as it arises). In cooler weather from 2 weeks to 18 days will be required for thorough fermentation. In warmer weather from 12 to 13 days will be sufficient. When fermentation is complete add the following solution:

Oil of bitter almond, 1 part; oil of clover, 1 part; caramel, 32 parts; alcohol, 192 parts.

The alcohol may be replaced by twice its volume of Club House or other good Bourbon whisky. A much cheaper but correspondingly poor substitute for the above may be made as follows:

Twenty-five gallons of soft water; 2 lb. tartaric acid; 25 lb. brown sugar, and 1 pint of yeast are allowed to stand in a warm place, in a clean cask with the bung out, for twenty-four hours. Then bung up the cask, after adding 3 gallons of whisky, and let stand for 48 hours, after which the liquor is ready for use.

2. Tartaric acid, 2 parts; common brown sugar ("New Orleans"), 25 parts; rain water, 200 parts; yeast, 1 part. Put into a clean keg or cask, with the bung out, and let stand in a warm place twenty-four hours. Add 25 parts of rectified spirit of wine, bung tightly, and let stand forty-eight hours, when it will be ready for use. The above is improved by adding to each gallon of spirit from 1 to 2 fl. drm. of apple essence (obtainable from dealers in bar supplies, or probably from any wholesaler). This gives it the apple aroma and flavor.—*National Druggist.*

Cider, Orange (Orange Wine).—Many of the preparations sold under this name are not really orange ciders, but are varying mixtures of uncertain composition, possibly flavored with orange. The following are made by the use of oranges:

1. Sugar	8 av. lb.
Water	2¾ gal.
Oranges	15

Dissolve the sugar in the water by the aid of a gentle heat, express the oranges, add the juice and rinds to the sirup, put the mixture into a cask, keep the whole in a warm place for 3 or 4 days, stirring frequently, then close the

cask, set aside in a cool cellar and draw off the clear liquid.

2. Express the juice from sweet oranges, add water equal to the volume of juice obtained, and macerate the expressed oranges with the juice and water for about 12 hours. For each gallon of juice add 1 lb. of granulated sugar, grape sugar or glucose, put the whole into a suitable vessel, covering to exclude the dust, place in a warm location until fermentation is completed, draw off the clear liquid, and preserve in well-stoppered stout bottles in a cool place.

3. Orange wine suitable for "soda" purposes may be prepared by mixing 3 fl. oz. of orange essence with 13 fl. oz. of sweet Catawba or other mild wine. Some sirup may be added to this if desired.—*Pharmaceutical Era.*

Cider Preservative, Bismuth as a.—L. Defour and Daniel find that the addition of 10 grm. of bismuth subnitrate to each hectoliter of cider prevents, or materially retards, the hardening of the beverage on exposure to air during use from casks; not only so, but the presence of the bismuth salt renders alcoholic fermentation more complete.—*Comptes Rendus.*

Cigar Speckling Fluid.—The process of marking artificially on cigar wrappers the light yellow spots which make cigars so marked preferred by smokers consists of the application of some active oxidizing agent, such as solution of chlorinated soda, nitric acid in proper dilution, or hydrogen dioxide solution.

We had occasion, says *The American Druggist*, recently to examine some samples of a liquid and powder used by a firm of cigar-makers to give the wrapper of an inferior tobacco the appearance of the speckled Sumatra leaf, and we found the powder to consist of ammonium carbonate, while the liquid was a fairly concentrated solution of H_2O_2. The mode of using the speckling material is to dissolve one part of the powdered ammonium carbonate in twenty-five parts of the solution of hydrogen dioxide. The spots are then produced by touching the dry leaf with this solution on the end of a pointed stick.

Several patents have been obtained for methods of spotting tobacco leaves artificially, and the following solution is said to be in use by a large firm of cigar manufacturers:

Sodium carbonate	3 parts.
Chlorinated lime	1 part.
Water, hot	8 parts.

Dissolve the washing soda in the hot water, add the chlorinated lime and heat the mixture to the boiling temperature for three minutes. When cool, decant into earthenware or stoneware jugs, cork tightly, and keep in a cool place. The corks of jugs not intended for immediate use should be covered with a piece of bladder or strong parchment paper, and tightly tied down to prevent the escape of gas and consequent weakening of the bleaching powder of the fluid. The prepared liquid is sprinkled on the tobacco, the latter being then exposed to light and air, when, it is said, the disagreeable odor produced soon disappears.

As a matter of information, it may be stated that the speckled appearance of certain tobacco wrappers as they are received in the natural state is due to the work of a species of fungus that attacks the growing tobacco. The tobacco grown on the island of Sumatra in the Dutch East Indies is found very frequently speckled in this way, especially the tobacco which comes from a certain district famed for the fine quality of the leaf. Cigars made from it are much esteemed by smokers who like a mixed cigar.

Cigars, Flavors for.—For flavors, the following are those most generally employed: Orris, 4 drm.; vanilla, 4 drm.; tonka, 4 drm.; alcohol, 8 fl. oz.; water, 4 fl. oz. Make a tincture.

2. Cascarilla, 12 drm.; valerian, 4 drm.; alcohol, 8 fl. oz.; water, 4 fl. oz. Make a tincture.

3. Cascarilla, 4 drm.; orris, 4 drm.; elecampane, 4 drm.; alcohol, 8 fl. oz.; water, 4 fl. oz. Make a tincture.

4. Tonka, 4 drm.; orris, 4 drm.; valerian, 4 drm.; alcohol, 8 fl. oz.; water, 4 fl. oz. Make a tincture.

5. Havana stems, 1 troy oz.; orris, 4 drm.; tonka, 4 drm.; alcohol, 8 fl. oz.; water, 4 fl. oz. Make a tincture.

To use these tinctures, dilute them with a mixture of 1 part of water and 2 parts of alcohol, using 3 parts of the diluent to 2 parts of the tincture. The liquid is applied as a spray. One oz. of the tincture should suffice for 5 lb. of tobacco leaves.

Cleansing.—*Chamois Skin, to Clean.*—1. Soak in a weak solution of washing soda, then in soap suds for two hours; then rinse thoroughly in water, and finally in a solution of soap and soda, and dry.

2. Wet the chamois leather in water just off cold—not at all hot—squeeze it between the two hands, then lay it flat on a board or table, and rub soap over both its sides; do not treat it as if it were a coarse cloth, but keep squeezing and opening and squeezing it in the hands to get the soap well through it. Next rinse it in several waters till the dirt is out—cold water always. Examine if more soap is wanted; if so, again lay the piece flat and rub the soap over every inch of it. Then press and squeeze and rinse as before until it becomes clean. Hang it up to half dry, then rub it in the hands to soften and stretch it, and continue this until it dries; finally roll it in a mangle.

Corks, Cleaning. Old corks can be cleaned by washing with water containing 10 per cent. of hydrochloric acid, then immersing in a solution of sodium hyposulphite and hydrochloric acid. Finally the corks are washed with a solution of soda and pure water, says *The Pharmaceutical Era.* Corks containing oil or fat cannot be cleaned by this method.

Crape, to Restore.—Black crape may be freshened and made to look almost equal to new if treated in the following way: Lay over the ironing table a piece of black cambric or cloth of any kind, and pin the piece of crape smoothly through to the blanket, stretching it out to its original size. Wring another piece of black cambric out of water and lay it over the crape, patting it down with the palm of the hand. Now take hot flatirons and pass them over the wet cloth, letting them just touch the cloth, but allowing no pressure to come upon the crape. When the cloth has become dry from the heat of the iron remove it, but let the crape remain pinned down until all the moisture has evaporated and it is perfectly dry. The crape will now feel and look like new. A long veil can be renovated in this way, making sure that the part redressed comes under the edge of the wet cloth.

Ink Erasers.—The following makes a good "two-solution" ink remover:

Solution A.

Citric acid	1 part.
Concentrated borax solution	2 parts.
Distilled water	16 parts.

Dissolve the acid in the water, add the borax solution, and mix by agitation.

Solution B.

Calcium chloride	3 parts.
Concentrated borax solution	2 parts.
Water	16 parts.

Add the calcium chloride to the water, shake well, and set aside for a week, at the expiration of which time decant the clear liquid, and to it add the borax solution. Directions for use: Saturate the spot with solution A, apply a blotter to take off excess of liquid, then apply solution B. When the stain has disappeared, apply the blotter, and wet the spot with clean

water. Absorb this with a blotter and repeat, applying water two or three times (to remove residual chemicals), finally dry between two sheets of blotting paper. Spots removed by this agent never return, and cannot even be brought back by the use of chemicals. Another formula, a most excellent one, and one that few inks can resist, is as follows:

A. Mix, in equal parts potassium chloride, potassium hydrochlorite, and oil of peppermint. B. Sodium chloride, hydrochloric acid and water in equal parts.

To use: Wet the spot with A, let dry, then pencil it over lightly with B, and rinse in clear water.

A good single mixture, which will answer for most inks, is made by mixing citric acid and alum in equal parts. If desired to vend in a liquid form, add an equal part of water. In use, the powder is spread well over the spot and (if on cloth or woven fabrics) well rubbed in with the fingers. A few drops of water are then added, and also rubbed in. A final rinsing with water completes the process.—*National Druggist.*

Linen, New Process of Cleaning Bed.—In a circular the Surgeon-General of the German army, Colan, in Berlin, calls the attention of heads of the garrison hospitals to a new cleaning method, which is to be employed in future, as thorough experiments have proved it to be of advantage. According to this method, petroleum is added to the water besides soap and soda, taking as many grammes of it as there are liters of water used; e. g., 30 grm. of petroleum to 30 lit. of water. This admixture of petroleum does not only admit of an easier cleaning, as well as less tear and wear on the linen, but the wash also retains its color, is thoroughly disinfected, and the expenses are considerably reduced by a saving in soap.—*Neueste Erfindungen und Erfahrungen.*

Machinery.—Blotting paper has been found very efficacious in the removal of grease.

Paint, to Clean Brushes and Vessels of Dry.—The cleaning of the brushes and vessels in which the varnish or oil paint has dried is usually done by boiling with soda solution. This frequently spoils the brushes or cracks the vessels if of glass; besides, the process is rather slow and dirty. A much more suitable remedy is amyl acetate, which is a liquid with a pleasant odor of fruit drops, used mainly for dissolving and cementing celluloid. If amyl acetate is poured over a resinfied oil paint brush the varnish dissolves almost immediately and, though ever so hard and dry, the brush is again rendered serviceable at once. If necessary, the process is repeated. For cleaning vessels shake the liquid about in them, which softens the paint so that it can be readily removed with paper. In this manner much labor can be saved. The amyl acetate can be easily removed from the brushes, etc., by alcohol, oil of turpentine or varnish.—*Farben Zeitung.*

Most agents for removing varnish and oil paint coatings owe their efficacy to the presence of caustic alkalies. But since the latter exercise a destructive action upon bodies of organic origin, the preparations containing caustic alkalies can only be employed to a limited extent and with the greatest care. They do not only have a decomposing influence upon the wood fiber, but their use is also quite dangerous owing to their strong caustic effect upon the human skin.

It has been found that the unpleasant by-effects of the caustic alkali can be completely obviated, while the dissolving power for the dry varnish and oil paint layer is yet materially increased, if a mineral oil is emulsified in the solution of the caustic alkalies. In order to maintain the oil lastingly in emulsion, the easily mobile mass is mixed with a sufficient quantity of an indifferent body, such as brick-dust, powdered pumice stone, sawdust, etc.; thus a form highly suitable for application, as that of a paste, is obtained. This paste constitutes a very efficacious and durable paint remover, which may be applied moist on any surface and exerises no deleterious action upon the fibers of the wood and the human skin.

For producing the new paint remover proceed as follows: Dissolve 20 k. of caustic soda (98 per cent.) in 100 l. of water, mix the solution with 20 k. of mineral oil and stir in a kettle provided with a mechanical stirrer, until the emulsion is complete. Now add with stirring 20 k. of sawdust and pass the whole through a paint mill to obtain a uniform intermixture.—*Neueste Erfindungen und Erfahrungen.*

Petrolatum Stains from Clothing, Removing.—Petrolatum stains may be removed from clothing, it is claimed (Merck's Report), by means of the following solution: Powdered soap, 1 part; aniline, 1 part; water, 10 parts.

The spots are moistened with the liquid, and after five to ten minutes washed with clean water. If necessary a second application is made.

Varnish, to Remove Oil Colors or.—A foreign journal—the *Bautechnische Zeitschrift*—publishes the following: Where oil colors or varnish are to be removed from the surface of floors or furniture, it is usual to treat them with soda. As a rule, a solution of ordinary washing soda is employed, and applied cold. This in time accomplishes its task, but its action is slow and not very efficient. A far better way is to use caustic soda, which can be bought in iron cans, and use the solution hot. With a hot lye of this sort oil color can be removed in a few minutes, and varnishes nearly as rapidly. As the solution attacks the skin, it should be applied with a cotton or hemp swab. A bristle brush is useless for the purpose, as the bristles dissolve almost immediately in the lye, leaving nothing but the handle of the brush, while cotton or hemp is not affected. When the wood is clean, it should be well washed with water. The strong soda lye darkens the color of oak, but, if this be objectionable, it can easily be corrected by brushing the wood over with dilute muriatic acid, washing it thoroughly as soon as the color is satisfactory, and finishing with a weak solution of soda, to neutralize the last traces of acid. In applying the acid, neither cotton or hemp can be used, as they are quickly destroyed, but bristle brushes are not affected, unless they are bound with iron. In general, care should be taken never to use muriatic acid in rooms or workshops where iron tools are lying about, as the vapor, even from dilute acid, is quickly diffused through the rooms, and attacks all iron or steel that it can reach. The best way is to make all acid applications in the open air. It is hardly necessary to say that cotton or linen clothes should be worn in using the soda lye, as a drop of lye, falling on woolen cloth, immediately makes a hole.—*National Builder.*

Wall Paper Cleaning.—The following has been recommended: Mix together 1 lb. each of rye flour and white flour into a dough, which is partially cooked and the crust removed. To this 1 oz. of common salt and ½ oz. of powdered naphthalin are added, and finally 1 oz. of corn meal and ½ oz. of burnt umber. The composition is formed into a mass, of the proper size to be grasped in the hand, and in use it should be drawn in one direction over the surface to be cleaned.

2. A method recommended by a practical painter and decorator is to take a soft, flat sponge, being careful that there are no hard and gritty places in it, then get a bucket of new, clean, dry, wheat bran from the mill or feed store. To use it, hold your sponge flat side up, and put a handful of bran on it, then quickly turn against the wall, and rub the wall gently and carefully with it; then repeat the operation. Hold a large pan or spread down a drip cloth to catch the bran as it falls, but never use the same bran twice. Still another way is

to use Canton flannel. The best way to use it is to get, say, 3 yards, and then cut it in strips lengthwise, a foot wide; then roll a strip around a stick 10 inches long, so as to have the ends of the stick covered. Have the stick not more than an inch in diameter. Have the cottonous or nap side of the cloth outside. Commence and wipe, when the cloth gets soiled unroll that much and make a roll of it, wipe again and repeat. Have your second or soiled roll turn in toward the first or clean roll. Hold them together with thumb and fingers. In this way you can change places on the cloth when soiled and roll the soiled place in, which will enable you to use the whole face of the cloth. To take out a grease spot requires careful manipulation. First, take several thicknesses of brown wrapping paper and make a pad, place it against the grease spot, and hold a hot flatiron against it, to draw out the grease, which will soak into the brown paper. Be careful to have enough layers of brown paper to keep the iron from scorching or discoloring the wall paper. If the first application does not take out nearly all the grease, repeat with clean brown paper or a blotting pad. Then take an ounce vial of washed sulphuric ether and a soft, fine, clean sponge, and sponge the spot carefully until all the grease disappears. Do not wipe the place with the sponge and ether, but dab the sponge carefully against the place. A small quantity of ether is advised, as it is very inflammable.

There are several ways by which wall paper can be cleaned so that it looks almost as good as new. Take a loaf of bread, stale, but not too hard, and cut off one crust; then, taking it in one hand, rub the paper gently with the exposed surface. When the bread looks soiled, cut off a very thin slice and proceed with the work. It is best to rub up and down on the paper, and clean each place thoroughly before leaving it. Another way is to take a loaf of bread, and, after removing the crust, soak it in cloudy household ammonia. It must be so wet that one can work it in the hands into a ball. Rub the paper lightly with it, and as the ball becomes soiled on the outside, knead it until a clean surface is exposed. This will remove the dirt and smoke and freshen the paper wonderfully. Another plan is to make a soft dough of coarse brown flour mixed with water; it should be stiff enough to handle easily. The paper can be rubbed with it as in the former method. When there are grease spots on the paper, lay coarse brown paper over them, and pass a hot iron over it. Fresh paper may be needed several times if the spot is large. When there are spots from which the color has been removed, they can be made to look as good as new by the use of water color paints. The design should be traced first, and the filling then put in with the paints.

3. Four oz. of pumice stone in fine powder are thoroughly mixed with 1 qt. of flour and the mass is kneaded with water enough to form a thick dough. This dough is formed into rolls about 2 inches in diameter and 6 or 8 inches long; each one is sewed up in a piece of cotton cloth, and then boiled in water for from 40 to 50 minutes—long enough to render the dough firm. After cooling and allowing the rolls to stand for several hours, the outer portion is peeled off, and they are then ready for use, the paper being rubbed with them as in the bread process.

Cloudy Ammonia. See **Ammonia.**

Coffee, Preparing.—For fine coffee the best results are obtained from a combination of true Java and genuine Mocha, mixed in the proportion of two-thirds of the former to one-third of the latter, fresh roasted, fresh ground and fresh made, while, with regard to quantity, 1, 2 or 3 tablespoonfuls to each pint of water is recommended, according to the number to be served and the strength required. The degree of strength is altogether a matter of taste; 2 oz., or 4 heaping tablespoonfuls, of pure, ground coffee, made with absolutely boiling water, will yield a full qt. of average strength, making a pleasant and well-flavored breakfast coffee. But for four persons a teacup of finely ground coffee—the finer the better—will be required, to be served as soon as made, as the infusion rapidly deteriorates by standing too long.

From Walsh's "Coffee, Its History, Classification," etc., we take the following formulas:

Cafe de Paris, or "French coffee," is generally prepared by mixing a cupful of finely ground coffee with a raw egg and shell in a quart of cold water and placing the pot over a brisk fire, occasionally stirring it until the boiling point is reached, after which set the vessel aside to simmer for a few minutes, then pour on a cupful of cold water and allow to stand for eight or ten minutes before serving, using cream and sugar to suit.—*Pharmaceutical Era.*

Coloring of Metals Including Blacking, Browning, Bronzing, Etc.—The reader interested in metal coloring should peruse this section carefully as it is not possible to arrange the subjects in exact alphabetical order.

Aluminum.—Blackening. A thoroughly good and practical way of blackening aluminum has until recently been unknown. The following, however, gives very good results: Polish the surface to be blackened with glass paper, then spread on it a thin film of olive oil, and heat slowly on a spirit flame. After awhile the oil boils and takes a golden color. Then lay on another coat of oil, and heat strongly. The golden color becomes brown and soon darkens to an intense black. Let the article cool, wipe off the oil and let dry.—*Cosmos.*

Black Color on Brass.—Elsner states that the production of a good black color on brass and bronze has excited a considerable amount of attention, and many attempts have been made to secure a good durable color. It is in great demand for coloring telescope tubes and similar optical instruments. He says: "We have many times been consulted concerning this matter, and for that reason have made some experiments, with the following results:

"To impart a black bronze to brass we make use of the following substances: An acid solution of pure silver, by dissolving pure silver in pure nitric acid; or a solution of bismuth nitrate; or of nitric acid alone; or an acid solution of silver nitrate containing some copper nitrate (such may be obtained by dissolving an ordinary silver coin in nitric acid); or a solution of copper nitrate alone may be used.

"According as one or the other of the above substances is used, so the bronze article will vary in tone. With copper nitrate it is always very black; with the bismuth solution gives a particularly deep brown color; that of copper and silver, a deep black.

"In every case the bronzed brass acquires a deeper shade, when the brass after bronzing is placed for some time in a solution of liver of sulphur, antimony sulphide, or in a solution of freshly prepared sulphureted hydrogen, or exposed to a moist atmosphere containing that gas.

"The operation is very simple, and is executed in the following manner:

"The respective metals are dissolved in pure nitric acid, taking care to have the acid in excess. Solution readily takes place without having recourse to the application of artificial heat. The solution is then applied to the previously heated articles by means of a paint-brush, and the heating of the metal is continued till the surface is quite dry. The solution employed must not be too concentrated, otherwise the colored film will wear off under the action of the brush or rubber in finishing. It is better to dilute the solution considerably

with soft water before applying it to the object, as the thinner the layer of liquid the firmer will the bronze adhere to the metal.

"Immediately the bronzing liquid has evaporated from the surface of the metal, it is rubbed with a dry leather or brushed with a dry brush in order to produce uniformity of surface. If nitric acid alone is used to color the brass, it forms on the surface a layer of copper nitrate, and there is therefore no need to previously dissolve copper in nitric acid for this purpose.

"The operation may require to be repeated several times, and a little experience will make known the most convenient method of manipulation.

"If the color is required to be an intense black, the brass should be treated with the *saline* solution of liver of sulphur before mentioned. In about half an hour the surface will become a deep black, and the operation is completed by rubbing the surface with a dry leather.

"When the operation has been repeated several times with the solution in question, it is necessary that the last should be very concentrated, otherwise the free acid will dissolve the bronze already formed. The bronzed surface should be covered with a solution of ammonium sulphide, taking care that the bronze is equally affected. It is not necessary to cover it with an excess of the sulphide, because the brass easily takes a black color in a little time by the liberation of sulphureted hydrogen. If it is desired to favor the disengagement of this gas, a few drops of hydrochloric acid may be added to the ammonium sulphide, so that the brass is plunged into a medium charged with sulphureted hydrogen.

"Another method for achieving the same result may be employed by using a solution of 1 part of neutral tin chloride and 2 parts of gold chloride, which must not be too dilute. The two liquids are mixed, and then used for bronzing the brass. In about ten minutes the article is wiped with a damp linen rag. If the use of a large excess of free acid has been avoided, the surface is a dead black, and very durable."

In order to test the effectiveness of certain re-agents referred to in the preceding paragraph, and to discover a good permanent black bronze, the following experiments were performed: Potassium sulphide, 30 grn.; ammonium chloride, 90 grn.; water, 2 pt.

The solution was applied with a brush, when the brass articles were allowed to stand about an hour and then were scratch-brushed. The operations were repeated until a satisfactory color was obtained. Other experiments were performed by immersing some brass articles in the solution instead of painting the solution on the work.

(*a*) Brass tray..tarnished to coppery-red.
(*b*) Brass tray..light brown color (poor).

(*a*) was done by painting the solution on to it as described above; (*b*) was bronzed by immersion in the hot solution, which was found to be much more effective, especially for copper goods.

This solution reacts very slowly on brass and cannot be recommended as a bronzing liquid for that metal, as much better results can be achieved by other solutions. A much lighter tone is imparted by means of scratch-brushing. The solution soon becomes exhausted and requires renewal. When freshly prepared and warm the solution smells like ammonium sulphide, but after working some time it smells like water containing flowers of sulphur in suspension.

The same solution, but with different proportions containing larger quantities of the two salts with the same quantity of water as before, was found to produce a darker shade of color. The following proportions were used:

Potassium sulphide	15 grn.
Ammonium chloride	200 grn.
Water	5 fl. oz.

A solution of ammonium sulphide was found to give results identical with those of potassium sulphide.

The following solution acts much more quickly on brass than the preceding one, producing a dark gray deposit of metallic arsenic, which becomes lighter on scratch-brushing:

White arsenic oxide	1 oz.
Hydrochloric acid	2 fl. oz.
Sulphuric acid	½ fl. oz.
Water	12 fl. oz.

A very good black color can be obtained on brass, as previously explained, by a solution of copper nitrate, 50 parts; water, 100 parts. If the work is too large for immersion, it is heated, and the solution is applied by means of a paint brush, when the heating is continued until the surface is dry. It is then gently rubbed with a linen pad, and brushed with or immersed in a solution of potassium sulphide, 10 parts; water, 100 parts; hydrochloric acid, 5 parts. Immersion of the work in the liquid produces much better results, and, after draining off the superfluous liquid, it is heated on a hot plate or over a clear fire till dry. We have obtained more uniform results by using a solution about three times more dilute than the preceding solution of copper nitrate, viz.:

Copper nitrate	100 parts.
Water	600 parts.

The heating process must not be continued longer than is necessary to convert the whole of the green salt which forms on drying into the black copper oxide.

A good black can be thus produced on brass in this way without recourse to the second pickling in potassium sulphide, but this second pickling is probably advantageous in fixing the color.—*Hiorns' Metal Coloring.*

Blackening Nickel.—Nickel, as well as copper, can be blackened by brushing with an aqueous solution of platinic chloride.

Blue.—Coloring Brass a Deep Blue.—A cold method of coloring brass a deep blue is as follows: 100 grm. of carbonate of copper and 750 grm. of ammonia are introduced in a decanter, well corked, and shaken until dissolution is affected. There are then added 150 c. c. of distilled water. The mixture is shaken once more, shortly after which it is ready for use. The liquid should be kept in a cool place, in firmly closed bottles or in glass vessels, with a large opening, the edges of which have been subjected to emery friction and covered by plates of greased glass. When the liquid has lost its strength, it can be recuperated by the addition of a little ammonia. The articles to be colored should be perfectly clean; especial care should be taken to clear them of all trace of grease. They are then suspended by a brass wire in the liquid, in which they are entirely immersed, and a to-and-fro movement is communicated to them. After the expiration of two or three minutes, they are taken from the bath, washed in clean water, and dried in sawdust. It is necessary that the operation be conducted with as little exposure to the air as possible. Handsome shades are only obtained in the case of brass and tombac—that is to say, copper and zinc alloys. The bath cannot be utilized for coloring bronze (copper-tin), argentine, and other metallic alloys.

Brass. Etc., Preliminary Treatment of Metals for Coloring.—In the first place, it is absolutely essential that any article or portion of an article to be bronzed by chemical means should be perfectly clean, as any dirt, grease, or oxide stains, although invisible to the naked eye before the body is placed in the pickling

solution, will be at once revealed after the process, showing up as ugly stains. After cleaning, the article should not be touched with the hands, or exposed to air any longer than necessary before being suspended in the bronzing solution, or the surface will be altered and the subsequent bronzing defective.

The article should be cleansed from dirt by washing with water and brushing with fine sand, pumice, whiting, etc., so as to remove all matter simply adhering to the surface. Grease and fatty matter as well as lacquer on old work may be best removed by boiling in a hot solution of caustic potash or soda, contained in a cast iron pot. The articles should be suspended by means of wire previous to immersion to avoid handling as much as possible. After boiling for some time they should be removed, and if not perfectly clean it may be necessary to scour with fine sand, swill in water, and again suspend in the solution.

Small articles may be freed from grease by dipping in benzine or paraffin. The best plan is to have three vessels containing the cleansing liquid. The first is used for dipping the articles so as to remove the greater portion of the grease by frequent dipping in and taking out to examine. The second dip is more pure and is used for removing the remainder of the dirt. The third or clean dip is used for removing the last traces that may not have been completely removed in the second bath. The article after removal from the third bath is left in the air to dry. The first and second dipping liquid may very conveniently be paraffin, and the third benzine. It should be observed that these liquids are very inflammable, and therefore must be removed from the vicinity of a naked light, especially in the case of benzine.

Large and bulky articles, such as copper, brass, iron and bronze goods, are best cleansed from grease in boiling potash or soda solution. One lb. of potash to 1 gal. of water is a convenient quantity to make a strong solution. It should be borne in mind that in boiling this solution the water only evaporates, leaving the remainder in a more concentrated state, so that the solution should be frequently made up with water, thus keeping the solution at a constant amount.

Zinc and tin articles may also be cleansed in potash solution, but care is required, as these metals are somewhat soluble in this liquid, and the fine lines of the pattern are liable to be removed. The best plan to adopt in the case of zinc is to allow it to remain only a short time in the solution, then to take it out and scrub it with a brush which has been dipped in fine wet sand. Care must be taken to thoroughly swill the cleaned articles in two or three lots of wash-water so as to remove every trace of potash, especially with zinc and tin articles. Moreover, the articles must be kept immersed in perfectly clean water until they are ready for the acid dip and bronzing bath, as they will tarnish if exposed to the air. Caustic potash or soda solution lasts a long time, and when it is partially exhausted may be renewed by adding fresh portions of the solid salt.

Another liquid in constant use for cleansing purposes is a solution of potassium cyanide. Potash and soda solutions themselves act as bronzing liquids in some cases, and most metals are colored more or less when immersed in them, especially when the solutions have been in use for some time. This is not always a defect, but occasionally it is important that the articles should leave the dipping liquid perfectly uncolored, and then a solution of potassium cyanide is valuable. About 1 lb. of good potassium cyanide dissolved in 1 gal. of water makes a solution of convenient strength.

Besides dirt and grease which may be removed by the methods just enumerated, articles are often coated with a film of some firmly adherent chemical compound which can only be removed by means of an acid, and therefore is not soluble in water or the liquids already described.

Brown.—Iron or Copper.—As it is frequently desired to give iron or copper articles a handsome and yet durable brown coloring, says the *Illustrirte Zeitung fuer Blechindustrie*, for which really good recipes are not at hand, we will give below some directions which have been tried in practice.

The process consists in rubbing the objects with a consistent mass composed of several substances and burning in the applied layer so as to prevent oxidation.

This method finds frequent use on copper ware, not only to avoid oxidation and the tiresome polishing which becomes necessary, but also to impart to the copper, whose natural color is rather glaring, an appearance more pleasing to the eye.

Annealing and careful cleansing with corrosives of the articles have to precede the browning process. A dark brown is obtained by stirring equal parts of verdigris and colcothar (English red) in vinegar to a pasty consistency, applying this on the well cleaned and dried parts, heating to redness, and quickly rinsing off in acetate of copper.

Another mixture which has likewise been found valuable is the following: Make a paste of two parts of finely powdered iron oxide with alcohol. This mass is applied with a brush as uniformly as possible, heat over an open fire, rinsing off, and polish with a soft brush.

If the desired effect of the color is not produced thereby, the operation must be repeated.

Lighter brown shades are produced by applying a composition of 2 parts verdigris, 2 parts vermilion, 5 parts sal-ammoniac, and 5 parts alum with vinegar. After the application the parts are heated and rinsed off.

With the above operations the greatest cleanliness must be observed, and the touching of portions to be browned with sweaty fingers must be avoided, else spots will result, which can only be removed by taking everything off again.

The process of browning has also found great favor in the manufacture of arms. The barrels of the guns, etc., are, for this purpose, thoroughly polished with emery, cleaned of all adhering grease, and rubbed with the following mixture: Antimony chloride, 2 parts; crystallized ferric chloride, 2 parts; gallic acid, 1 part; water, 4 parts. This is allowed to dry in a warm place ten or twelve hours; then the article is warmed slightly, rubbed with a woolen rag, and polished with olive oil and wax. This is repeated according to how the color turns out.

Another good mixture consists of equal parts (by weight) of butter of antimony and olive oil, and 1 part silver nitrate in 500 parts water, as well as 54 parts blue vitriol, 26 parts alcohol, 14 parts nitric acid, 3 parts iron filings, and 200 parts water.

Copper, Brown to Black Colors on.—1. A dilute solution of ammonium sulphide used cold yields very beautiful effects, as shown by the following results:

This solution works very well for copper, but it is not suitable for brass. The solution works well either hot or cold, strong or dilute. The colors depend more upon the manipulation of the process than upon either temperature or density. Colors may be obtained ranging from a neutral crimson through brown and steel-gray to black.

This solution may be used for bronzing work which is too large to immerse in the solution, by moistening it with a sponge or cloth, then allowing the articles to stand exposed to the air till they are dry, when they may be scratch-

brushed and the moistening repeated if the color is not deep enough, or the bronzing not uniformly distributed. When the right tint is attained, the articles should be thoroughly washed, first with warm water, then with cold water, and finally dried out in sawdust and brushed with a wax brush.

2. A similar solution may be formed by dissolving potassium sulphide (liver of sulphur) in water. The following were tried:

1. Potassium sulphide..... ½ part.
Water..... .....99½ parts.

A coppered ash-tray assumed a dark steel-gray color after immersion in the solution.

2. Potassium sulphide..... ¼ part.
Water..... 99¾ parts.

A coppered ash-tray received a reddish-gray color. The remarks made with regard to the ammonium sulphide solution apply also to potassium sulphide. The color may be modified in the manipulation of the working of both solutions. Darker colors can be produced by a longer immersion, and these again can be further modified by judicious scratch-brushing.

3. The following solution has been recommended for producing a reddish-brown color, which becomes paler on heating:

Dissolve 1 part of copper acetate in 16 parts of water; then add sufficient ammonia to give a deep blue solution, and add 2 parts of potassium sulphide, 3 parts of ammonia, and 10 parts of water. The following was used by the author:

Copper acetate.....	60	grn.
Water.....	2	fl. oz.
Ammonia, till the solution is blue.		
Potassium sulphide.....	120	grn.
Ammonia.....	3	fl. drm.
Water.....	1¼	fl. oz.

This solution gave precisely the same results as with potassium sulphide and water, so that the other constituents appear to be useless. The reaction on copper is instantaneous, but brass is simply tarnished.

4. A dark color on copper may be obtained by immersion, or by painting the following liquid on the articles: Arsenic oxide, 120 grn.; hydrochloric acid, ½ fl. oz.; sulphuric acid, 60 fl. grn.; water, 3 fl. oz. The solution works quickly both on copper and brass, but does not produce a pure black on either; the deposit of arsenic has a dark gray color, which becomes lighter on scratch-brushing. If copper is dipped momentarily into the solution it receives a very thin transparent film of arsenic, which on scratch-brushing presents a pinkish-gray color.

5. The following solution is recommended for obtaining a deep black color on copper and its alloys: Copper nitrate, 100 parts; water, 100 parts. The above salt is dissolved in the water, and the article, if large, is painted with it; if small, the article may be immersed in the solution. It is then heated over a clear coal fire and lightly rubbed. The article is next placed in or painted with a solution of the following composition: Potassium sulphide, 10 parts; water, 100 parts; hydrochloric acid, 5 parts. We have obtained more uniform results by using a solution about three times more dilute than the above, viz.: Copper nitrate, 100 parts; water 300 parts. Small work can be much more conveniently treated by immersion in the solution, and after draining off or shaking off the excess of the solution to heat the work on a hot plate until the copper salt is decomposed into the black copper oxide. It would be difficult to heat large articles upon a hot plate, but a closed muffle furnace should give better results than an open coal fire. In any case the heating process should not be continued longer than is necessary to produce the change mentioned above.

A good black can be produced upon brass in this way without the aid of the potassium sulphide solution, which imparts a bluish tint to the copper oxide. The black coloration does not appear to adhere so firmly to copper as it does to brass, and, considering this circumstance, it is probable that the subsequent immersion of blackened copper work into the potassium sulphide is an advantage.

6. A great variety of shades of brown may be produced on copper by a barium sulphide solution, beginning with a tone only a little darker than copper itself, and passing through crimson to light brown, and then through a succession of darker shades until a very dark brown, nearly black, is reached.

It appears difficult to obtain the crimson color uniformly distributed over the surface of the work, so that this method cannot be recommended for that color. The brown colors, however, are very rich in tone, and very easily produced in almost any required shade, and their distribution is practically uniform. The bronzed surface will also stand a severe scratch-brushing, and is, in fact, improved by that process, but rendered a little lighter in tone. It is well, therefore, to produce a color in the solution a little darker than that required upon the finished work.

The effect produced upon work having relief parts can be heightened by rubbing those parts, after bronzing, with a wet cork, which has been dipped in silver sand, so as to expose the underlying metal, in which condition the work may be finished. If it is preferred, after treating the metal in the manner just described, it may be immersed momentarily in the bronzing solution until the exposed copper takes a different shade of color to that upon the general surface of the work, when the whole may be scratch-brushed and finished.

If the solution is strong—say 100 grn. of barium sulphide to 1 pint of water—and hot, a black color is imparted to copper immediately after immersion; but if the solution is used cold, this result is only achieved after some time. A dilute solution, containing say 25 grn. of the sulphide to 1 pint of water, can be more easily controlled, and the process arrested at any required stage of coloration.—*Hiorns' Metal Coloring.*

Copper, Coloring of.—A new blacking fluid has been invented by M. Mazure. According to *Cosmos*, this liquid has the following formula: Bismuth chloride, 1 part; mercury bichloride, 2 parts; copper chloride, 1 part; hydrochloric acid, 6 parts; alcohol, 5 parts; water, 50 parts. Mix. To use this fluid successfully, the articles to be blacked or bronzed must be clean and free from grease. It may be applied with a brush or swab, or, better still, the object may be dipped into it. Let the liquid dry on the metal, and then place the latter into boiling water, and maintain the temperature for half an hour. If the color is then not as dark as desired, repeat the operation. The editor of *The National Druggist* finds it to work beautifully. After getting the desired color, the latter is fixed and much improved by placing for a few minutes in a bath of boiling oil, or by coating the surface with oil and heating the object until the oil is driven off. See also *Brown to Black Colors on Copper.*

1. A very beautiful and pleasing color of a light brown shade may be quickly produced by a mixture of 1 part copper sulphate, 1 part zinc chloride, 1 part water.

The above forms a paste which is applied to the article and allowed to dry on it. It is then well washed with water, when a uniform color is obtained. This would be one of the most valuable colors if it were permanent, but unfortunately it is changed by the action of light to a dark green, almost black. This change also occurs when the bronze is coated with a film of transparent lacquer, and although we have tried several methods of preventing the change, no suitable remedy has yet been discovered.

2. The following mixture forms an excellent bronzing solution, and may be used for copper articles with or without subsequent heating: Take 120 grn. of copper sulphate, ½ pt. of water. Boil the water until the copper sulphate is dissolved, neutralize the solution with sodium hydrate, then add 150 grn. of red iron oxide. Now immerse the copper articles in the turbid solution, take out and heat on hot plate. Repeat the operation until a reddish-brown color with a violet tint is obtained. The violet tint can only be observed in full daylight. Electro-deposited copper received a full and rich reddish-brown color, and cast copper a lighter brown. These beautiful colors become darker in tone by more heating.

This solution gives good results, both on copper and brass, by immersion only, without the addition of heat, but the color is not of that deep rich tone which is secured by subsequent heating. The best effects are obtained after the process has been repeated once or twice. The results achieved by heating over a charcoal fire were found to be most effective.

3. A solution similar to the former one, with the omission of iron oxide, produces very good coloring effects, but the colors are paler in tone. Take 120 grn. of copper sulphate, 9 fl. oz. of water. Boil and add strong sodium hydrate solution until a precipitate sufficient to render the solution turbid is formed. Immerse the articles, and treat them as in former method.—*Hiorns' Metal Coloring.*

Green Patina on Zinc Roofs which lasts for years is produced in the following manner: Cleanse the zinc of all dirt and coat it repeatedly with a diluted solution of copper nitrate. When the whole roof has been coppered over, cover it with a likewise diluted solution of carbonate of ammonia. On this coat of copper patina readily forms.—*Maler Zeitung.*

Iridescent, to Render Brass or Nickel Fixtures.—To give beautiful iridescence to nickel, brass or copper fixtures prepare a solution of 1 part of lead acetate to 3 parts of sodium hyposulphite in 48 parts of water and into this plunge the articles and let stand. Remove from time to time, and as soon as the requisite depth of color is obtained, rinse off and let dry spontaneously. The iridescence is very beautiful and quite lasting.

Liquid, Bronze.—For the production of liquid bronze, acid-free varnish should be used, as bronze ground with ordinary varnish will form verdigris. For the de-acidification of damar-resin, pour 1,000 grm. of petroleum benzine over 350 grm. of finely ground damar-resin, and dissolve by repeated shaking. Next, add to the solution 250 grm. of a 10 per cent. aqueous solution of caustic soda and shake up well for ten minutes. After standing for a short while two strata will have formed, the upper one consisting of benzine-resin solution and the lower, aqueous one, containing the resinic acid dissolved as soda salts. Pour off the benzine layers and agitate again assiduously with 250 grm. of the 10 per cent. caustic soda solution. Now set aside for a complete classification and separation of the two liquids. The damar solution siphoned off will be perfectly free from acid. To obtain gold bronze varnish, add to the de-acidified damar solution about 250 grm. of bronze or brocade per liter.

Or else carefully mix 100 grm. of finely ground damar-resin with 30 grm. of calcined soda and heat to fusion, in which state it is maintained two or three hours with frequent stirring. Now let cool, grind the turbid mass obtained and pour 9 c.c. of coal benzine or petroleum benzine over it in a flask. By repeated shaking of the flask the soluble portion of the molten mass is dissolved; filter after allowing to settle; into the filtrate put 300 to 400 grm. of bronze powder of any desired shade, the brocades being especially well adapted for this purpose. If the metallic powder remains distributed over the mass for a long time, it is of the right consistency. If it deposits quickly, it is too thin and a part of the solvent must be evaporated before stirring in the bronze powder.—*Oil, Paint and Drug Reporter, from the Zeitung fuer Blechindustrie.*

Royal Copper Finish.—The copper coloring is termed royal copper from its intense red color. It is produced by dipping a solution of 2 drm. sulphide of antimony, 1 oz. pearlash to 1 pt. of water, or by boiling the copper articles for 15 minutes in a strong solution of tartar and water.

Concrete, a Good.—A concrete is used in France for business purposes that possesses the necessary qualities of solidity and hardness. It is composed of 8 parts of sand, gravel and pebbles; 1 part of common earth, burned and powdered; 1 part of powdered cinders and 1½ parts of unslaked hydraulic lime. These materials must be thoroughly beaten up together; their mixture, when properly moistened, gives a concrete which sets almost immediately, and becomes in a few days extremely hard and solid, properties which may be still further increased by the addition of a small quantity—say 1 part—of Portland cement. It is stated that many large buildings have been constructed of this material in France—in one case a house three stories in height, 65x45 feet, standing on a terrace, having a retaining wall built perpendicular 20 feet high and 200 feet in length. Every part of this structure was made of hard concrete, including foundations, vaults of cellars, retaining wall, and all walls, exterior and interior, as well as the cornice work, mouldings, string courses, parapets and balustrades, and the building has no band iron in the quoins or other plan to bind it together. All lintels over doors and windows and sills are composed of the same materials, being cast in moulds.—*National Builder.*

Copper, Royal, Finish. See **Coloring,** *Royal Copper.*

Corks, Cleaning. See **Cleansing.**

Crape, to Restore. See **Cleansing.**

Custard Powder. See **Powders.**

Depilatory, Liquid.—(Clayton.)—The following, from *The Pharm. Post*, is a formula for a *liquid* depilatory: Tincture iodine, 6 parts; oil turpentine, 6 parts; castor oil, 8 parts; alcohol, 48 parts; collodion, 100 parts.

To be used once or twice daily for three or four days. The film formed is then pulled off rapidly, so as to take the hair with it.—*Pharmaceutical Era.*

Disinfectant, Liquid.—What is ordinarily meant by a disinfectant for use about the house is a deodorizing antiseptic. Copperas, on account of its cheapness, is most frequently used, and is efficient. It has one especial recommendation in its cheapness. The fault found with it is, that it produces rust stains and unsightly discolorations wherever it is used. This does not interfere with its usefulness in stables, outhouses, drains, etc., but is an objectionable feature. Salts of alumina, especially the sulphate, answer the purpose better for use about the house, but are, of course, somewhat more costly. A strong solution of chloride of zinc, prepared by dissolving scrap zinc, or zinc oxide, to saturation in muriatic acid, is of much greater intrinsic value as a disinfectant, and on the whole is probably the best thing to recommend. The only objection to it is that it is poisonous, and it should never be sold without a poison label. Among the disinfectants said to be especially useful in destroying foul odors is thymol, which may be most conveniently used in the form of an alcoholic solution, to be employed with a spray apparatus.

Here are a number of typical formulas:

Household Disinfectant.—Iron sulphate, 8 oz.; ammonium chloride, 1 oz.; corrosive sublimate, 1 drm.; alcohol, 4 oz.; water, to make 32 oz.

Dissolve the iron sulphate in 24 oz. of water and the corrosive sublimate in the alcohol. Mix both solutions, add the ammonium chloride and enough water to make 32 oz. Mix with equal parts of water, and use as a disinfectant.

Solution of Four Chlorides.—Alum, 10 oz.; sal soda, 10 oz.; sal-ammoniac, 2 oz.; common salt, 2 oz.; chloride zinc, 1 oz.; muriatic acid, commercial, q. s.; water, quantity sufficient to make 1 gal.

Dissolve the alum in ½ gal. of boiling water, then add the sal soda, which gives a precipitate of aluminum hydrate. Muriatic acid is then added in sufficient quantity to dissolve this precipitate, thereby forming aluminum chloride. The other salts are then dissolved in the remainder of the water and added to the first solution. The advantages claimed for this preparation are cheapness, ease of preparation, odorless, non-poisonous, and its adaptability for general use. Its freedom from iron, in the disinfection of clothing, is an important point, insomuch that it will not injure the fabric in any way.

Liquid Deodorant for Water Closets.—Ferric chloride, 4 parts; zinc chloride, 5 parts; aluminum chloride, 5 parts; calcium chloride, 4 parts; manganese chloride, 3 parts; water, sufficient to make 90 parts.

Dissolve, and add to each gallon 10 grn. thymol and ¼ oz. oil of rosemary, previously dissolved in about 6 parts of alcohol, and filter.

Disinfecting Fluid for Sick Room.—Guaiacol, 50 grm.; eucalyptol, 40 grm.; menthol, 20 grm.; carbolic acid, 30 grm.; thymol, 10 grm.; oil clove, 5 grm.; alcohol, q. s. 1,000 grm. To be sprayed about with water.—*Pharmaceutical Era.*

Lime Water for Disinfection.—A very cheap and easily prepared disinfectant is lime water. If wash is laid in saturated lime water, it must be left therein for 48 hours to insure a total extermination of all germs. If one desires to get the wash disinfected after 24 hours, it must be previously rinsed off in supersaturated lime water and left to remain in it for some time; then it is put in fresh lime water and left therein for 24 hours. Wool is very unfavorably changed in color and firmness by treatment with lime water, while linen and cotton are not at all affected as regards color; linen does not lose any of its firmness, cotton very little. Hence, woolen goods should not be disinfected with lime water; of course, the lime water must not be very strong.

Dry Batteries. See **Batteries.**

Egg Powder. See **Powders.**

Eggs, Preservative for.—Various preparations for preserving eggs for winter use are sold to unsophisticated housewives, and usually at a good profit to the manufacturer. The principle upon which most of such compounds act is that of excluding the air; almost any wax or varnish will serve this purpose. There are two requisites—have the eggs fresh and clean and put them up as late in the season as possible.

One very ancient and universally applied method consists in dipping the eggs into melted wax or paraffin. We append a formula for preparing a coating solution which duplicates one very extensively sold:

1. Gelatine	½ oz.
Borax	⅛ oz.
Water, to make	10 oz.

Dissolve the gelatine in the hot water in which the borax has been previously dissolved; bottle. If too stiff, warm the solution; rub on the eggs, or dip the eggs in the solution.—*Bulletin of Pharmacy.*

2. Marsh dissolves in each gallon of water 12 oz. of quicklime, 6 oz. of common salt, 1 drm. of soda, ½ drm. saltpeter, ½ drm. tartar, and 1½ drm. of borax. The fluid is brought into a barrel and sufficient quicklime to cover the bottom is then poured in. Upon this is placed a layer of eggs, quicklime is again thrown in, and so on until the barrel is filled so that the liquor stands about 10 inches deep over the last layer of eggs. The barrel is then covered with a cloth, upon which is scattered some lime.—*Pharmaceutical Era.*

Electro-Metallurgy.—*Aluminum, Electro-Plating with.*—The essential features of a new system of electro-plating with aluminum are as follows: A solution of ammonia alum in warm water is prepared, containing 20 per cent. of alum. To this is added a solution containing about the same quantity of pearlash and a little ammonium carbonate. The mixture results in effervescence, and in the deposition of a precipitate. The latter is filtered off and well washed with water.

A second solution of ammonia alum, containing 16 per cent. of alum and 8 per cent. of pure potassium cyanide, is now prepared warm and poured over the precipitate previously obtained, the mixture being then boiled for 30 minutes in a closed iron vessel, jacketed to insure uniformity of heating.

The proportions suitable in the above solutions are as follows: First alum solution.—Ammonia alum, 2 kg.; warm water, 10 kg. Pearlash solution.—Pearlash, 2 kg.; warm water, 10 kg.; ammonium carbonate, 8 to 10 grm. Second alum solution.—Ammonia alum, 4 kg.; warm water, 25 kg.; potassium cyanide, 2 kg.

At this stage about 20 kg. of water are added and about 2 kg. more of potassium cyanide, and the whole is kept on the boil for about a quarter of an hour. The liquid is then filtered from the precipitate, and is now ready for use in the electrolytic bath.

The anodes are perforated or slotted plates of aluminum, arranged so that they can be conveniently raised or lowered. The cathodes receive the deposit.

The anodes and the cathodes are connected respectively to the terminals of a battery or of a dynamo machine, and the current is thus transmitted through the bath, which is kept throughout the operation at a temperature of about 80° to 150° Fah.

By attaching to the aluminum anode pieces of other metals, *e. g.*, gold, silver, nickel, copper, etc., the tint of the deposited metal can be somewhat varied. When the deposit presents a gray tint, it is brightened by dipping the plated article in a solution of caustic soda, which has also the effect of impeding oxidation.—*Electrical Review.*

Coppering Bath for Zinc.—This bath is composed as follows:

Crystallized acetate of copper	200 grm.
Carbonate of soda	200 grm.
Crystallized bisulphide of soda	200 grm.
Potassic cyanide	300 grm.
Distilled water	10 liters.

This solution should be energetically boiled before being used.

Electro-plating with Aluminum.—In *The Jewelers' Journal* the following recipe for electro-plating with aluminum is given by Herman Reinbold:

Fifty parts of alum, $AlK(SO_4)_2+12H_2O$, are dissolved in 300 parts of water, and to this 10 pars of chloride of alumina (Al_2Cl_6) are added, heated to 200° and cooled, whereupon 39 parts of cyanide of potassium is added. The object to be plated has to be cleaned, and to be absolutely free from grease in any form, whereupon it is suspended in the bath over the electro-positive electrode, the plate of metallic aluminum to be suspended on the negative pole. The electric current ought to be weak. The plating when polished will be found to be equal to the best silver plating, having the advantage of not being oxidized or getting black when brought into contact with sulphurous vapors, which would make it especially valuable for plating spoons and tableware.

TABLE SHOWING THE COMPOSITION OF COPPER BATHS, RECOMMENDED BY VARIOUS AUTHORITIES.

No.	Authority.	Special Application of Bath.	Most suitable Temperature (F.)	1 Copper Acetate	2 Copper Carbonate	3 Copper Cyanide	4 Copper Sulphate	5 Potassium Cyanide	6 Sodium Sulphite	7 Sodi. Bisulphite	8 Ammonia (0·880)	9 Caustic Soda	10 Sodium Carbonate	11 Potassium Carbonate	12 Potassium Bitartrate	13 Sodium-Potassium Tartrate	14 Sulphuric Acid	15 Pure Water.	Special Method of Preparation.
				PARTS BY WEIGHT OF INGREDIENTS.															
1	Acid bath	Electrotype	Cold	..	..	..	150	.	..	.	..	..	..	..	..	..	50	1000	
2	Dépierre	Zinc rollers	..	14	..	..	..	20	..	..	8	..	.	..	..	..	..	1000	Dissolve **5** in 800 of **15**; **1** and **8** in 200 of **15**; mix.
3	Elsner	Iron & zinc	..	..	*q. s.*	..	.	..	..	..	..	..	..	little	100	..	..	1000	Boil **12** with **15**; saturate with **2**; then add **11**.
4	Gore	"	Hot or cold	..	..	*q. s.*	..	225	..	..	..	..	..	..	..	..	..	1000	Dissolve 200 of **5** in **15**; saturate this with **3**; add rest of **5**.
5	Japing	"	..	14	..	..	..	20	12		8	..	..	..	..	..	..	1000	Dissolve **5** and **6** in 800 of **15**; proceed as above (Dépierre).
6	"	"	..	..	..	..	76	76 to 108	..	.	..	..	..		..	.	..	1000	Dissolve **4** in 450 of **15**; mix with **5** dissolved in rest of **15**.
7	Kasalowsky	..	Warm	20	..	..		28	8	.. 20	12	.	20	..	..	..	..	1000	Dissolve **5**, **6**, and **10** in 800 of **15**; mix with **1** and **8** in 200 of **15**.
8	Roseleur	..	Hot or cold	20	..	..	..	20	..	20	..	..	20	..	..	..	..	1000	
9	"	Iron & steel	Cold	19	..	..	..	16	..	20	14	..	40	..	..	..	..	1000	
10	"	"	Hot	20	..	..	..	22	..	8	12	..	20	..	..	.	..	1000	
11	"	Cast iron, tin, zinc	Hot or cold	14	..	..	..	16	..	12	8	..	.	..	..	..	..	1000	
12	"	Zinc	Nearly boiling	18	..	..	..	22	..	4	6	..	..	..	..	..	..	1000	
13	Watt	"	110°—130°	..	..	..	50	125	..	..	excess	..	..	..	..		..	1000	Dissolve **4** in 250 of **15**, add excess of **8** and 250 of **15**, add slowly (stirring) **5** in 500 of **15**.
14	"	Iron, zinc, etc.	..	..	..	..	..	12·5	37·5	..	..	12·5	..	..	25	..	..	..	1000	Dissolve **4** in water, add **8** and **11**, then **5**, and decant.
15	Weiss	Zinc	..	20	..	..	..	25	..	20	12	.	25	..	..	..	.	1000	Dissolve **7** and **10** in 500 of **15** (=*a*); dissolve **5** in rest of **15** (=*b*); dissolve **1** in **8** (=*c*). Mix *a* and *c*; add *b*; boil and filter.
16	"	Zinc, tin, lead, iron	..	..	..	..	30	25	..	20	..	..	65	..	..	..	..	1000	
17	Weil	"	..	..	..	..	35	..	..	..	..	80	..	..	..	150	..	1000	

NOTE TO TABLE.—Potassium Cyanide containing 95 per cent. of pure salt is understood; if a less pure article be used, more must be added proportionately.

The black figures in the last column refer to the numbers of the vertical columns denoting the various ingredients. *q. s.*=*quantum sufficit*.

TABLE SHOWING THE COMPOSITION OF SILVER BATHS FOR SEPARATE CURRENT PROCESS, RECOMMENDED BY VARIOUS AUTHORITIES.

			1	2	3	4	5	6	7	8	9	10	11	12	
			PARTS BY WEIGHT OF INGREDIENTS.												
No.	Authority.	Special Application of Bath.	Silver Chloride	Silver Cyanide	Silver Iodide	Silver Nitrate	Silver Oxide	Silver Carbonate	Potassium Cyanide (35 %)	Potassium Iodide	Sodium Carbonate	Sodium Chloride	Ammonia	Water	Special Method of Preparation, etc.
1	Böttger. .	Cast iron		....	...	15·6	....	....	31·2	....	....	15·6	....	1000	Dissolve **4** in 250 of **12**; add **7**, and then **10** in 750 of **12**.
2	Elsner . .	....	....	....	.. .	18	....	...	30	....	....	....	....	1000	Dissolve **4** in part of **12**, **7** in rest of **12**; mix.
3	Gore . . .	....	....	8·7	....	....	...	....	14	....	....	...	....	1000	
4	" . . .	To "whiten"	....	34	....	....	....	....	20·5	....	55	...	....	1000	(Use 3 to 10 Smee cells in series.)
5	" . . .	To finish	....	10·2	....	....	....	....	30·6	....	....	....	...	1000	(" " " parallel.)
6	Parkes . .	....	....	....	....	....	3·7	..	50	....	....	....	....	1000	
7	Pfanhauser	....	....	....	....	15	....	...	25	....	....	....	....	1000	Dissolve **4** in 500 of **12**; and **7** in rest; mix. Filter, if necessary.
8	"	....	....	12·5	....	....	....	....	18	....	.. .	....	....	1000	
9	Roseleur .	....	....	25	...	...	...	....	28	....	...	....	....	1000	Dissolve **7** in **12**, and **2** in mixture.
10	Volkmer .	Steel plates	25	....	....	...	..	....	150	....	....	....	....	1000	
11	Wahl . . .	....	....	31	....	....	....	....	35	....	....	....	....	1000	
	" . . .	Striking	....	4·2	....	....	....	..	37·5	.	....	....	....	1000	(Rogers Plating Co., U. S. A.)
		Plating	36·3	....	....	....	....	....	37·5	....	....	....	..	1000	
12	" . . .	Striking	....	3·3-4·2	...	....	....	. .	75-100	....	....	....	....	1000	(Meriden Plating Co., U. S. A.)
		Plating	....	25·4	....	....	...	....	75	....	....	....	....	1000	
13	Watt . . .	....	....	....	....	....	....	9	*q. s.*+*xs.*	....	....	....	..	1000	Mix **6** in **12**; add just sufficient **7** to dissolve **6**, and then slight excess.
14	" . . .	German silver	....	....	15·2	..	....	....	*q. s.*+*xs.*	....	....	....	....	1000	(Requires no quicking.)
15	" . . .	To obtain very white deposits	9·3	....	....	...	....	....	*q. s.*+*xs.*	...	....	....	....	1000	
16	Weiss. . .	....	9·3	....	....	....	....	....	35	....	35	14	*x.s.*	1000	Dissolve **1** (freshly precipitated from 7 Ag.) in **11**; add rest of ingredients.
17	" . . .	Iron and steel	11·1	....	....	....	...	....	44	....	34	..	....	1000	
18	Zinin . . .	....	....	....	....	6·7	....	..	....	500	....	....	....	1000	Dissolve **4**; add **8**; use weak current.

NOTE TO TABLE.—The black figures in the last column refer to the numbers of the vertical columns denoting the various ingredients. *xs.*=excess,

TABLE SHOWING THE COMPOSITION OF NICKEL BATHS FOR

No.	Authority.	Special Application of Bath.	1 Nickel Acetate	2 Nickel Carbonate	3 Nickel Chloride	4 Nickel Citrate	5 Nickel Nitrate	6 Nickel Phosphate	7 Nickel Sulphate	8 Nickel-Ammonium Sulphate	9 Cobalt-Ammonium Sulphate	10 Potassium Citrate	11 Sodium Bicarbonate	12 Sodium Bisulphite	13 Sodium Phosphate
			PARTS BY WEIGHT												
1	Adams,	....	...	....	....	..	...	....	....	50-80	....	...	..	....	....
2	Boden,	....	...	....	....	....	26·7	....	..	....	....	....	....	33	....
3	Desmur,	Small goods	....	....	....	....	....	...	....	70	....	..	8	...	....
4	"Electricias,"	....	...	....	....	....	....	....	....	50	....	....	....	....	...
5	Hospitalier,	....	....	....	....	....	....	....	....	100	....	....	...	....	....
6	Langbein,	Printing surfaces	..	....	....	....	....	....	60-72	....	....	...	....	...	....
7	"	....	....	4-5	....	....	....	....	....	50-60	....	....	....	....	....
8	Nägel,	....	....	....	....	....	....	....	54	....	....	..	....	....	....
9	Pfanhauser,	....	....	...	....	....	....	....	50	....	....	...	50	..	....
10	"	..	..	....	....	....	...	....	50	....	....	....	....	....	....
11	Potts,	...	27·5	....	....	....	....	..	....	....	....	....	....	..	....
12	Powell,	....	...	....	....	....	....	....	....	50	....	....	....	....	....
13	"	....	....	....	....	15	....	15	30	..	....	....	....	....	...
14	"	....	....	....	....	15	....	25	...	...	....	....	....	3	26
15	Roseleur,	....	....	....	....	....	....	....	....	40	....	...	....	..	....
16	Volkmer,	....	....	..	....	....	..	....	111	....	....	....	...	...	...
17	Watt,	Tin, britannia metal, etc.	..	....	....	...	....	....	....	33·3	....	....	....	....	....
18	"	Iron	....	...	....	....	....	....	....	40	....	....	....	....	....
19	Weiss,	....	....	....	...	...	....	....	50	....	....	....	....	....	....
20	"	....	..	....	....	....	....	..	....	50	....	..	....	....	....
21	"	Iron and steel	....	....	....	....	....	...	....	50	....	....	....		....
22	"	Zinc	....	....	....	....	...	....	42	...	....	17	....	...	...
23	"	....	....	....	42	....	....	...	....	....	...	....	....	...	....
24	"	Hard deposit	....	..	....	..	....	...	....	40	10	....	....	....	....
25	Weston,	..	....	....	....	....	....	....	..	50-67	..	...	....	..	....

NOTES TO TABLE.—The black figures in the *last column* refer to the numbers of the vertical nearly boiling, are generally employed at the ordinary temperature.

SEPARATE CURRENT PROCESS, AS RECOMMENDED BY VARIOUS AUTHORITIES.

14 15 16 17 18 19 20 21 22 23 24 25

OF INGREDIENTS.

Ammonia	Ammonium Carbonate	Ammonium Chloride	Ammonium Sulphate	Ammonium Tartrate	Calcium Acetate	Acetic Acid	Benzoic Acid	Boric Acid	Citric Acid	Tannic Acid	Water	Special Method of Preparation
..	....	....	....	....	....	....	....	....	....	....	1000	Neutralize, if necessary, with ammonia.
26·7	....	....	....	....	....	....	....	....	....	....	1000	Dissolve **12** in **25**; than add rest.
....	....	....	....	....	....	....	....	....	....	....	1000	Warm sol. of **8** in **25**; add **11** slowly.
....	..	....	....	36·5	....	....	....	....	....	0·25	1000	Stir all with 150 of **25**; then add rest of **25**.
....	....	....	....	....	....	....	....	....	....	....	1000	Boil, cool, and filter.
....	....	....	19-22	....	....	....	....	....	4-5	....	1000	
....	....	....	.. ..	....	....	....	....	25-30	....	....	1000	
190	....	...	....	....	..	....	....	...	....	....	1000	
....	....	....	....	....	....	....	....	....	....	....	1000	
....	..	50	....	...	....	....	....	....	....	....	1000	
....	....	....	....	....	25	*q. s.*	....	....	....	....	1000	
....	*q. s.*	....	20	....	....	....	....	....	5	....	1000	Add **15** last, till just neutral.
....	...	....	....	....	..	....	7·5	....	...	....	1000	
37	....	....	....	...	..	....	....	....	7·5	....	1000	
....	*q. s.*	....	....	....	....	....	....	.. .	...	....	1000	Pour sol. of **15** into sol. of **8** till just neutral; avoid alkalinity.
....	....	22-33	....	....	....	....	....	....	....	....	1000	
....	....	....	6·6	....	....	....	....	....	....	....	1000	
....	....	....	6	....	....	..	....	....	....	....	1000	
....	*q. s.*	....	50	....	....	....	....	....	*q. s.*	....	1000	Boil **7** and **17** with **25**, add **15** till neutral; then **23** till just acid.
.. .	....	...	15	....	....	..	....	....	*q. s.*	....	1000	
....	...	....	25	..	....	....	....	....	5	....	1000	
...	....	25	....	....	....	....	....	....	....	....	1000	
....	....	42	...	....	....	....	....	....	....	....	1000	
....	....	....	17	....	....	.. ..	....	....	....	....	1000	(Mixed cobalt-nickel precipitate.)
....	....		....	....	....	....	. .	15-30	....	....	1000	

columns representing the various reagents. All the solutions, except No. 8, which may be used

TABLE SHOWING COMPOSITION OF GOLD BATHS FOR SEPARATE-CURRENT PROCESS, RECOMMENDED BY VARIOUS AUTHORITIES.

				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
No.	Authority.	Special Application of Bath.	Most Suitable Temperature (F.)	PARTS BY WEIGHT OF INGREDIENTS.																Special Method of Preparation.
				Gold in Form of				Potassium Cyanide	Potassium Sulphocyanide	Potassium Ferrocyanide	Potash	Potassium Carbonate	Sodium Bisulphite	Sodium Hyposulphite	Sodium Phosphate	Ammonium Chloride	Ammonium Sulphide	Water		
				Chloride	Cyanide	Oxide	Ammonium													
1	Becquerel	....	....	6·5	...	....	....	....	....	100	...	..	...	....	....	....	....	1000		
2	De Briant	....	Hot or Cold	....	....	8·5	....	....	....	100	25	....	....	....	....	....	...	1000	Add 3 (neutral) to 7 and 8 in 15.	
3	Fizeau	....	....	4	...	...	....	...	....	....	q. s.	....	....	....	..	....	....	1000	Dissolve 1 in 15; add 9 till just cloudy.	
4	Gore	...	....	6·8	....	....	....	100	....	....	....	....	....	....	....	....	....	1000		
5	"	....	...	11	....	....	....	80	....	....	....	....	....	....	.	....	....	1000		
6	"	....	....	27·4	....	....	....	200	....	....	....	....	....	....	....	....	....	1000		
7	Kick	....	....	10–15	....	..	....	50	....	....	....	....	....	....	....	....	....	1000		
8	Levol	Silver	....	q. s.	....	....	....	...	q. s.	....	...	....	....	....	....	....	....	1000	Dissolve 1 in 15; add 6 till ppt. just redissolves. Just acidify with hydrochloric acid.	
9	Lerebour	....	....	0·6	....	....	....	....	....	..	....	....	....	4	....	....	....	1000		
10	M. J. L. (Gore)	Copper, Brass, Silver	Hot	....	....	6·2	....	125	....	....	.	....	....	..	....	....	....	1000	Boil together for half an hour.	
11	" "	....	....	1·6	....	....	....	....	....	25	....	....	....	....	....	....	....	1000	Boil 1 and 7 with 250 of 15, filter and add rest of 15.	
12	Pfanhauser	....	Warm	0·35	...	....	..	4–5	....	....	....	....	....	....	....	....	....	1000		
13	Roseleur	....	Cold	10	...	....	...	20	....	....	....	....	....	....	....	....	....	1000	Dissolve 1 in 200 of 15, and add to 5 in 800 of 15. Boil half an hour.	
14	"	Silver, Copper, Ger. Silver	122°-176°	1	....	....	....	1	....	.	....	....	10	....	60	...	...	1000	Dissolve 12 in 800 of 15; cool; add 1 in 100 of 15 slowly; dissolve 5 and 10 in rest of 15. Mix.	
15	"	Iron & Steel	122°-176°	1	....	...	....	0·5	....	....	....	....	12·5	....	50	....	....	1000		
16	"	....	....	1·5	....	..	....	....	....	20	....	15	...	...	...	3	....	1000		
17	"	Watch Movements	....	....	....	....	4	12	...	....	....	....	....	....	....	....	....	1000	Dissolve 4 in 5 and 15. Boil for fifteen minutes; cool.	
18	De Ruolz	...	60°-77°	....	7·2	....	....	100	....	....	....	....	....	....	....	....	....	1000		
19	Wagner	....	....	0·7	....	....	....	10	....	....	....	....	....	....	....	....	....	1000		
20	Watt	....	130°	....	2·1	....	....	x. s.	....	....	....	....	.	....	....	....	....	1000		
21	"	....	....	....	....	....	2·1	x. s.	....	....	....	....	....	....	....	....	....	1000		
22	"	....	100°-150°	4	....	....	....	little	...	60	....	....	....	....	....	10	...	1000	Dissolve 7 and 13 in some of 15, add 1, a little of 5 and rest of 15.	
23	"	...	130°	1	....	....	....	x. s.	....	....	....	....	....	....	....	....	q. s.	1000	Precipitate 1 with 14, filter; dissolve ppt. in 5 and 15.	
24	Weiss	....	....	....	....	....	0·35	3	....	...	..	....	....	.	....	....	....	1000		
25	Wood	...	90°	6·8	....	....	....	27·4	....	....	....	....	....	....	....	....	....	1000		

NOTES TO TABLE.—The black figures in the last column refer to the numbers of the vertical columns, denoting the various ingredients. The weights of gold in columns 1 to 4 represent the amounts of actual metal to be converted into the compounds specified. *Ppt.=precipitate.*

Explosives.

Composition.—The following table shows the composition of the more important kinds.

Name of Powder.	Sulphur.	Saltpeter.	Sodium Nitrate.	Potassium Chlorate.	Nitro-glycerine.	Guncotton.	Charcoal.	Sawdust.	Other Ingredients and Notes.
Bennett	×	×					×		Ordinary powder, with 7 per cent. of gypsum.
Lannoy	×	×						×	
Davey	×	×							+ starch.
Pyronome	20		52·5						+ 27·5 tan.
Oxland	16		85				18		+ 20 lignite.
Robert Dole	×	×					×		+ 18 dehydrated sodium sulphate.
Schwartz (I.)	9·2	48·6	26·5				14·7		
" (II.)	9·6	56	18·1				15		
Kup	9	66	8				16		
Budenberg	10	34	40				8		+ 4 lignite + 4 sodium tartrate.
Kellow and Short	10	10	20	10					+ 64 tan.
Spence				×			×		+ sodium carbonate or starch.
Vynaud		2					22		+ 76 barium nitrate.
Neumeyer		×					×		+ potassium cyanide.
White powder				1					+ 1 potassium cyanide + 1 sugar.
Dynamite					78				+ 22 sand.
Dualine					80	20			
Rendrock		40			40				+ 13 cellulose + 7 paraffin.
Giant powder	8	40			36		8		
Vulcan	7	48			35		10		
Mica					52				+ 48 mica.
Hercules			1		77				+ 2 cellulose + 20 magnesium carbonate.
Electric					33				Rest unknown.
Dessignolles		50							+ 50 potassium picrate + charcoal if used for cannons or small firearms.
Brugéres		50							+ 50 ammonium picrate.
Tonite						52·5			+ 47·5 barium nitrate.
Explosive gelatine					89	7			+ 4 camphor.
Atlas A.			2		75			21	+ 2 magnesium carbonate.
" B.			34		50			14	+ 2 magnesium carbonate.
Judson (No. 2)	13·5		60		20		12·5		
" (No. 3)	16		64		5		15		
Rackarock				77·5	22·5				
Forcite					95	5			
Gelignite		32			56·5	3·5		8	
Pyrolite (I.)	20	51					1·5	11	
" (II.)	17	18	1·7					12	+ 6 sodium sulphate.
Saxifragine (I.)							21		+ 77 barium nitrate.
" (II.)		2					22		+ 76 barium nitrate.
American powder		49							+ 23 sugar + 28 potassium cyanide.
Erhardt		1		1			4		+ 2 tannin material.
Hahn		367·5					18		+ 46 spermaceti + 168·5 antimony sulphide.
Horsley				9					+ 3 powdered galls.
Spence		20					2	7	+ 2 oil + 5 sodium carbonate.
Roburite		×							+ nitronaphthalene.
Carbodynamite					90		10		
Meganite			×		×	×			
Fortis	×	×							+ tan.
Cordite or Abel					92	8			
Green powder				70					+ 20 picric acid + 10 potassium cyanide.

NOTE.—× denotes that the amount of ingredient present is unknown.—*Industries.*

Electrotyping Non-conducting Materials, New Process for.—For electrotyping on non-conducting materials, such as china and porcelain, a new and ingenious process has been lately introduced in France. Sulphur is dissolved in oil of spike lavender to a sirupy consistence; then chloride of gold or chloride of platinum is dissolved in ether, and the two solutions mixed under a gentle heat. The compound is next evaporated until of the thickness of ordinary paint, in which condition it is applied with a brush to such portions of the china, glass, or other fabric as it is desired to cover, according to the design or pattern, with the electrometallic deposit. The objects are baked in the usual way before they are immersed in the bath.

Enameling.—*Black Enamel for Bicycles.*—1. Oil tar, 16 oz.; asphaltum, 4 oz.; resin, powdered, 4 oz.

Mix and dissolve with the aid of heat over a water bath, care being taken to prevent contact with flame.

2. Amber, 16 oz.; linseed oil, 8 fl. oz.; asphaltum, 3 oz. av.; resin, 3 oz. av.; oil turpentine, 16 fl. oz.

Heat the linseed oil to boiling and add the amber, asphaltum and resin; when melted, remove to the open air and add gradually the oil of turpentine.

3. This enamel is waterproof and wears well; it imitates closely the natural blue of steel, such as is on the "Cleveland" bicycle, and it can be removed with a rag soaked in alcohol at any time. It will keep indefinitely when tightly corked, and may be used on any metal.

Bleached shellac, 5 parts; borax, 1 part; alcohol, 5 parts; water, 4 parts; methylene blue, sufficient.

Dissolve the borax in the water; the shellac in the alcohol (by maceration), reserving a small portion to dissolve the methylene blue. Heat the watery solution to boiling and add the alcoholic solution, stirring constantly; stir out any lumps and add the blue solution. Paint with a soft brush on the spokes, which have been cleaned bright with emery cloth. The quantity of blue needed is very small; by grading the amount employed, any shade from a dark blue to a light steel color may be obtained.

Etching.—*Glass.*—In the opaque etching of glass it has hitherto been thought necessary to use certain expensive fluorine salts in the preparation of the etching solutions. It has quite recently been discovered by A. Lainer that comparatively cheap etching can be prepared. In Dingler's *Polytechnisches Journal* Lainer gives two recipes which obviate the use of the more expensive fluorine salts.

1. Two solutions are first prepared: (*a*) Consisting of 10 grm. of soda in 20 grm. of warm water; (*b*) consisting of 10 grm. potassium carbonate in 20 grm. of warm water. Solutions *a* and *b* are now mixed, and to the mixture is added 20 grm. of concentrated hydrofluoric acid, and afterward a solution (*c*) consisting of 10 grm. of potassium sulphate in 10 grm. of water is added.

2. This recipe contains the following ingredients: Four c. c. of water, 1½ grm. of potassium carbonate, 0·5 c. c. of dilute hydrofluoric acid, 0·5 c. c. of hydrochloric acid, and 0·5 c. c. of potassium sulphate. This mixture is treated with hydrofluoric acid and carbonate of potassium until it produces the required degree of opacity on being tried upon a piece of glass.

Lainer considers that the addition of a small quantity of hydrofluoric acid to solution 1 brings about a fine granulated appearance on the surface that is treated with it. But it appears that there is a still simpler process than either of these; it was invented by Herr Kampmann, of Vienna. In preparing an opaque etching fluid Kampmann uses a wooden vessel, the iron fittings of which are protected from the corrosive action of the acid fumes by a layer of asphaltous material. This vessel is filled to about one-fifth of its contents with strong hydrofluoric acid, which is then partially neutralized by cautiously and gradually adding some crystals of soda; more soda is added, and the mixture is stirred with a small wooden rod. The point at which the neutralization of the acid should cease is indicated by the mixture frothing and becoming sufficiently viscid to adhere to the stirring rod. It is, perhaps, hardly necessary to say that the acid fumes are highly injurious and that this process should be carried on in the open air, in order to allow the vapor to pass rapidly away. The most hygienic and satisfactory process of all would be to carry on the operation in a draught cupboard.

The contents of this wooden vessel now consist of sodium fluoride and the unneutralized hydrofluoric acid. This mixture is now transferred to a wooden tub and diluted with from five to ten times its volume of water, according to the degree of dilution that is desired. It is objectionable to use this mixture in a too highly concentrated condition, for then the etched surface of the glass is irregular, coarse grained, and apparently strewn with tiny crystals; if, on the other hand, the dilution be too extreme, the etched surfaces will be transparent instead of opaque. Either of these two conditions of the etching fluid can easily be remedied; for, if it be too strong, water must be added, and if too weak, a small quantity of hydrofluoric acid, partially neutralized with soda, must be mixed in.

A good recipe for preparing a small quantity of this etching fluid is the following: 240 c. c. commercial hydrofluoric acid, 600 grm. powdered crystallized soda, 100 c. c. water.

These etching fluids are best used by taking the following precautions: The glass is first thoroughly cleansed from all impurities, and is then provided with a rim of wax composed of the following ingredients: Beeswax, tallow, colophony and powdered asphalt kneaded together. The rim prevents the acid from spreading over those parts of the surface which it is not desired to etch. The glass is now etched for a few minutes with an ordinary etching solution (H. F.—1:10), which is then poured off, the surface being afterward washed with water and wiped as dry as possible with a piece of sponge.

The surface is now ready for the opaque etching fluid, which is poured on till it forms a thick layer. The operation is allowed to progress for one hour, when the liquid is poured away and the surface washed with water. Water is further allowed to stand on the glass until a thin film of silicate is observed to form; this film is then brushed off and the surface finally cleansed with water and the wax removed.

By varying the action of this opaque etching fluid or paste various degrees of opacity may be produced, and if the opacity be greater than that which is desired, the surface can be cleared to any extent by using the etching solution of hydrofluoric acid.

3. A citizen of Berlin, M. Retzlaff, is the patentee of a method of etching on glass or percelain and other glazed surfaces. In the usual German method of etching such materials the surface is provided with a layer of tinfoil affixed by means of a cement. The drawing which is to be etched is then marked on this layer of foil and cut out with a scraper. The parts of foil thus cut out are then removed, and the layer of cement underneath washed off by means of turpentine, thereby leaving bare places on the glass or porcelain surface for etching upon.

The purpose of M. Retzlaff's invention is to substitute for the cutting out of the design, which requires time and skilled workmanship, a chemical process, by means of which the pat-

tern desired can be etched in shorter time, in a more perfect manner, and exactly following the lines of the design. This process consists in transferring the pattern desired to the layer of tinfoil in grease colors, by means of printing or stenciling, etc. The tinfoil leaf is fixed to the glass surface by an adhesive asphalt; the printing of the tinfoil can be undertaken equally well after its adhesion; the so prepared vitreous body is then placed in an acid which dissolves the tinfoil.

The asphalt layer, by means of which the foil was affixed, being now freed, is washed off, thereby allowing the etching on the freed parts of the glass to be proceeded with in the usual manner. The design appears, according to the above described operation, etched in relief on a glass surface. Naturally a sunk etching can be produced in a similar manner. The etchings thus executed are said to be distinguished by special sharpness of outline.—*Pottery Gazette.*

Etching on Steel.—Nitric or hydrochloric acid or mixtures of the two are employed as the "acid" in marking or etching on steel. The following are among the methods employed:

1. Glacial acetic acid..... ..... 4 parts.
   Absolute alcohol ..... 1 part.
   Nitric acid (sp. gr. 1·28)..... 1 part.

Allow the acetic acid and alcohol to remain for half an hour, then add nitric acid carefully. Etch from one to fifteen minutes. Of course the parts you wish to protect from corrosion must be covered with beeswax, tallow, or similar substance.

2. Cover the surface with a thin coat of asphaltum varnish of fine quality, then cut the design through to the surface of the steel and etch with a weak solution of nitric acid in water; finally wash with hot water and remove the asphaltum with hot turpentine.

3. Clean the steel and cover evenly with wax, cut the lines with a steel point through the wax and pour on the following etching fluid: Pyroligneous acid, 4 oz.; alcohol, 1 oz.; nitric acid, 1 oz., by measure. Or use iodine, 1 oz.; iron filings, ½ drm.; water, 4 oz. Etching fluid is removed as soon as the metal is sufficiently etched.

4. *To Etch on Steel.*—The first step to be careful about is to have the print heavily inked and then powdered up with dragon's blood several times before starting to etch. To do this properly, every operator has noticed that after powdering and slightly heating, additional powder will stick, and will form a heavy coating in two or three operations with the powder. Before proceeding to heat up good, the plate should receive a light etching in a weak solution of the acid described later on. By giving this etching, the print is cleaned up, and will not thicken up the lines, as would be the case without this etching. Then a good strong heating should be given. On top the dragon's blood plumbago may be used in addition. For etching use nitric acid mixed with an even amount of acetic acid. Some operators use vinegar, based on the same theory. When commencing the etching, start with a weak solution and increase as soon as the plate is deep enough to allow another powdering. If the operator is familiar with lithography, and understands to roll the print up with a lithoroller, the etching of steel is not harder than etching on zinc.—*Process Review.*

Face Paints, Grease Paints, Etc.—*White.*—Oxide of zinc, subnitrate of bismuth, and plumbate of alumina, of each 1 oz.; mix and make into a paste with almond oil (5 or 6 drm. required) and perfume with 12 min. of oil of peppermint, 12 grn. of camphor, and 1 drm. of bouquet essence.

Deep Bordeaux Red.—Oxide of zinc, subnitrate of bismuth, plumbate of alumina, of each 15 drm.; oil of peppermint, 12 min.; camphor, 12 grn.; carmine, 30 grn. (dissolved in 80 min. of water in ammonia); almond oil, a sufficiency. Perfume with 1½ drm. bouquet essence.

Skin Color.—Vermilion, 3 drm.; tincture of saffron, 2 drm.; powdered orris, 5 drm.; precipitated chalk and oxide of zinc, of each 20 drm.; camphor, 20 grn.; oil of peppermint, 20 min.; almond oil, a sufficiency. Perfume with bouquet essence, as in the foregoing.

Theatrical face paints are sold in sticks, and there are many varieties of color. Yellows are obtained with ocher, browns with burnt umber, and blue is made with ultramarine. These colors should in each case be levigated finely along with their own weight of equal parts of precipitated chalk and oxide of zinc and diluted with the same to the tint required, then made into sticks with mutton suet (or vaseline or paraffine, equal parts) well perfumed. By blending these colors, other tints may thus be obtained.

Fatty face powders have a small percentage of fat mixed with them in order to make the powder adhere to the skin. The following formula is taken from *Pharmaceutical Formulas:*

Dissolve 1 drm. anhydrous lanoline in 2 drm. of ether in a mortar. Add 3 drm. of light magnesia. Mix well, dry, and then add the following: French chalk, 2 oz.; powdered starch, 1½ oz.; boric acid, 1 drm.; perfume, a sufficient quantity. A good perfume is coumarin, 2 grn., and otto of rose, 2 min.

Nose Putty.—Mix 1 oz. wheat flour with 2 drm. of powdered tragacanth and tint with carmine. Take as much of the powder as necessary, knead into a stiff paste with a little water and apply to the nose, having previously painted it with spirit gum.

Nigger Black.—Beat the finest lamp-black into a stiff paste with glycerine and apply with a sponge; if necessary, add a little water to the mixture when using. Or you can make a "grease paint" as follows: Drop-black, 2 drm.; almond oil, 2 drm.; cocoanut oil, 6 drm.; oil of lemon, 5 min.; oil of neroli, 1 min.; mix.—*Formulas from The Pharmaceutical Era.*

Fire Extinguishing Liquids.—One of the best agents—probably the best—is aqua ammonia, without any addition whatever. We have personally had experience with the almost marvelous power of this substance in this direction. In one instance, where fire had originated, probably from spontaneous combustion, in a pile containing several tons of cotton seed, and the interior of which was almost a solid body of live coal, a half gallon of ammonia completely smothered the fire. In another, which occurred at Savenay, France, the vapors of a tank containing 50 gallons of gasoline caught fire in the linen room of a laundry. The room was instantly a mass of living flames, but a gallon and a half of ammonia water thrown into it completely, and almost immediately, extinguished the fire. The ammonia was in a glass demijohn in an apothecary shop next door to the laundry, and was thrown into the room by the druggist as an experiment. So completely was the fire extinguished that workmen were enabled to enter the room almost immediately, where they found the iron tank of gasoline intact.

Next in order as an extinguisher comes carbonic acid gas.

The following was patented in France several years ago, after numerous public exhibitions of the ability of the liquid to subdue fire. Make six solutions, as follows:

1. Ammonium chloride, 200 parts; water, 20,000 parts.

2. Alum, calcined and powdered, 350 parts; water, 10,000 parts.

3. Ammonium sulphate, powdered, 3,000 parts; water, 5,000 parts.

4. Sodium chloride, 2,000 parts; water, 40,000 parts.

5. Sodium carbonate, 350 parts; water, 5,000 parts.

6. Liquid waterglass, 4,500 parts.

Mix the solutions in the order named, and to the mixture, while still yellow and turbid, add 20,000 parts of water. Let stand, and when the precipitate has settled, decant the clear liquid into thin blue glass containers, each holding from three pints to a half gallon.—*National Druggist.*

7. Calcium chloride, 30 parts; magnesium chloride, 10 parts; water, 60 parts.

Another has the following formula:

8. Sodium chloride, 20 parts; ammonium chloride, 9 parts; water, 71 parts.

And still another—

9. Sodium carbonate, 16 parts; sodium chloride, 64 parts; water, 920 parts.

Fireproofing of Tissues.—At the Berlin exhibition of means and contrivances for the prevention of accidents in industries and otherwise, prizes were awarded for the following processes of fireproofing, respectively, diminishing the combustibility of tissues, curtain materials, and theatrical scenery, viz.:

1. For light tissues: 8 k. pure ammonium sulphate, 2½ k. pure ammonium carbonate, 2 k. pure borax, 3 k. boric acid, 2 k. starch, or 400 grm. dextrin, or 400 grm. gelatine, and 100 k. water are mixed together, heated to 30° C., and the material impregnated with the mixture, centrifugated and dried, and then ironed as usual. One liter of the mixture, costing about 3 or 4 cents, is enough to impregnate 15 yards of material.

2. For curtain materials, theatrical decorations, wood, furniture; 15 k. ammonium chloride are mixed with so much floated chalk as to give the mass consistency; it is then heated to 50°-60° C., and the material given one or two coats of it by means of a brush. A k. of it, costing about 4 to 5 cents, is sufficient to cover 5 square yards.

3. For wood, cordage, straw matting, packing, cloth; 15 k. ammonium chloride, 6 k. boric acid, 3 k. borax, are dissolved in 100 k. water, the material laid down in the solution for 15-20 minutes at 100° C., squeezed and dried. One liter costs about 5 cents.

4. For paper, printed or not: 8 k. ammonium sulphate, 3 k. boric acid, 2 k. borax, are dissolved in 100 k. water, and the solution applied at 50° C.

Flannel, to Shrink New.—New flannel should always be washed before it is made up. It can be cut out more accurately, and the grease that it contains extracted. Wash it in clean, warm water, as warm as the hand can bear, and entirely by itself. Rub the soap to a lather in the water, or the flannel will become hard. Wash it in this manner through two warm waters, rinse it in another warm water, with just sufficient soap in it to give it a whitish appearance; to this water add a little indigo blue; wring and shake it well, and while drying shake, stretch and turn it several times. Flannel washed in this manner will be white and soft as long as it lasts. When dry let it be clapped and stretched with the hands, and rolled tight and smooth till wanted.

Flies, to Keep off Stock.—1. Carbolic acid, 1 oz.; oil of pennyroyal, 2 oz.; spirit of camphor, 2 oz.; oil tar, 4 oz.; glycerine, 2 oz.; fish oil, 2 oz.

2. Pine tar, 1 part; fish oil, 2 parts.

The oil is used to keep the tar from sticking; if fish oil cannot be obtained, lard oil may be used. An addition of 2 oz. of crude carbolic acid to the gallon of paste will improve it. Paint the mixture on when necessary.

3. Black oil, 1 qt.; crude carbolic acid, 4 oz.; fish oil, enough to make 1 gal.—*Pharmaceutical Era.*

4. Oil of cloves, 3 parts; bay oil, 5 parts; eucalyptus tincture, 5 parts; alcohol, 150 parts; water, 200 parts.

Food, Malted, Infants'.—Powdered malt, 1 oz.; oatmeal, finely ground, 2 oz.; sugar of milk, 4 oz.; baked flour, 1 lb.

Fruit Juices, Preservation of.—Express the juice of any fruit; filter and pour into champagne bottles; fill them up to the bend of the necks; cork tightly and fasten the corks down with cord or wire; then put the bottles into a kettle; set them on a double sheet of coarse paper, placed on the bottom of the kettle, and pack the bottles loosely in with hay or cloths; then fill the kettle up to the necks of the bottles with cold water; place over a moderate fire and let boil for twenty minutes, then remove the kettle from the fire, allowing the bottles to remain in the kettle until the water becomes cold; then seal the corks and pack the bottles sideways in a cool, dry cellar. Prepared in this way, they will keep in a perfect state for a very long time. Fruit pulps are preserved in precisely the same way, except that they have about an ounce of finely powdered sugar added for each bottle of pulp so put up.—*Pharmaceutical Era.*

De Brevans, in "Manufacture of Liquors and Preserves," gives the following formulas:

Juices of Huckleberries, Barberries, Cherries, and Grapes.—Crush the fruit and pass the pulp through a horsehair sieve; crush the marc and unite and carry to the cellar. After twenty-four hours of fermentation filter and preserve. The juice of cherries is better when a mixture of black and red cherries is used.

Orange and Lemon Juice.—Remove skin and seeds, crush the pulp and press, and mix with rye straw washed and cut fine, to assist the separation of the juice. Clarify by repose, filter, and preserve.

Quince, Pear, and Apple Juice.—Peel and rasp the fruit, taking care not to touch the seeds. Press the pulp, mixed with rye straw, washed and cut fine. Clarify by repose, filter, and preserve. The quinces should be fully ripe.

Raspberry Juice.—Crush the fruit and press the marc. The liquid is allowed to respose for one or two days, after which it is filtered. One-fifth of the weight of red cherries is sometimes added to the raspberries. Another process reported to have given excellent results is this one: The clarified juice is heated to boiling in a copper vessel and then poured into a dish. Meanwhile the bottles are provided with stoppers, and are then gradually filled, a space of about two centimeters in the neck being left empty; some alcohol is then poured upon the hot liquid, and the bottle is quickly stoppered, the cork being further secured as the liquid cools. The alcohol which evaporates into the empty space is sufficient for the preservation of the juice. The juice of fresh herbs may be preserved in the same manner. This process seems to be an entirely unobjectionable one. It is generally believed that many of the fruit juices as found in the market are usually preserved by means of antiseptics and anti-ferments, such as salicylic acid, boric acid, boroglyceride, sodium sulphite, peroxide of hydrogen, formaldehyde, etc.

Fruit Preserving.—Good preserves, etc., can be bought, but a great saving is effected by making them yourself, and you also have the satisfaction of knowing what is in them. Preserves, pickles, sauces, etc., are not, of course, necessary articles of diet, that is, we could live without them and enjoy good health too; but they are decidedly palatable, and by adding a "smack," as it were, make a good meal better; they also improve the appearance of a table.

Strawberry Jam.—Strawberries and all other berries should not be overripe nor gathered immediately after a fall of rain, as they are then apt to be watery; they should be ripe, perfectly fresh, and sound. Hull the strawberries and, if they are sandy, wash them in cold water; then put them in a colander and let them drain. The strawberries may be left whole or mashed,

though it is better to mash them, as they break during the cooking, anyhow.

Always use a granite or porcelain kettle in preference to tin or brass, as the acid in the fruit acts upon the metal and forms a poisonous compound. Measure the strawberries and allow equal parts of fruit and sugar. Do not use cheap sugar, but good fine granulated. Put the strawberries and half the sugar into the kettle, and boil for 5 minutes; then add the remainder of the sugar and boil 30 minutes. Skim often and be very careful that it does not burn. Asbestos mats are very useful in all preserving and pickling; for, when fruit and pickles have to cook any length of time, it is almost impossible to keep them from sticking to the bottom of the kettle. When the jam is done, pour it into large-mouthed bottles or glasses which are standing in a shallow pan of hot water. This prevents the jars from breaking. A silver fork or spoon placed in the jar is also a help, as the silver quickly carries off some of the heat. Let the jam cool; then pour 1 tablespoonful of brandy over the top, or cut out some round pieces of white paper to fit over the top of the jam, and dip these in brandy; this is more economical, as 1 tablespoonful of brandy for each jar soon uses up a pint. Cut out some round pieces of paper large enough to entirely cover the top of the jar and come down for an inch or so on the sides; paste these on with flour paste. Keep all preserves, jams, etc., in a dark, warm, dry place; if they are kept in the basement they are apt to mould. With canned fruit and pickles it does not matter if they are kept in a cold, damp place.

Raspberry, Blackberry and Gooseberry Jams are made in the same way. When making red raspberry jam, add ¼ lb. of red currants to every pound of raspberries; they improve the flavor.

Preserved Strawberries, Raspberries, and Blackberries.—The berries should be ripe, fresh, and sound. If they are sandy, wash them in cold water. Measure them and allow ¾ lb. of granulated sugar to every pound of fruit. Into a preserving kettle put first a layer of fruit, then a layer of sugar, and let it stand overnight. In the morning cook slowly until the fruit is soft; 20 minutes will be about the time required. This is one very good way. Another is: Put the sugar and fruit into the kettle in the morning, and let them cook slowly without stirring until the sugar is melted and begins to boil. Then boil briskly for 25 minutes. Skim frequently. Have the jars standing in a shallow pan of hot water to prevent their breaking. Fill them to the brim and screw the tops on immediately. As the contents cool, you will find that the tops can be screwed still tighter. Turn the jars upside down, and leave them this way overnight. If any of the jars are found to have leaked during the night, screw the tops tighter still, and when the jars are put away leave them turned upside down. There is then no danger of the air getting in.

When making red raspberry preserve, use 1 bowl of red currants to every 4 bowls of raspberries; the currants heighten the flavor.—*By Mrs. Henry Esmond, in Home Study Magazine.*

A compound for the preservation of fruits, vegetables, etc., in the raw state has the following formula:

Boracic acid, 1 part; salicylic acid, 1 part; sodium carbonate, 1 part; white sugar, 16 parts; water, 32 parts.

Mix and dissolve. Of this sirup add 1 part to 6 parts of water to make the preserving liquid. A variation of this, said to be better as a preservative, is as follows:

Salicylic acid, 1 part; sodium carbonate, 1 part; alum, 1 part; sugar, 1 part.

Dissolve in 128 parts of water to make a stock solution. Add 1 part of the solution to 8 parts of water to make the preserving liquid.—*National Druggist.*

Gelatine, Non-setting.—There are many purposes for which a non-setting gelatine is of considerable value, the direct carbon or pigment printing being one. Long, long ago, so long as to be almost forgotten, Maxwell Lytte, we think, introduced a method of producing one, under the name of "meta gelatine," but the following, recommended by Dr. F. Mallmann, will be found both simpler and better:

Water, 1,000 parts; chloral hydrate, 250 parts; gelatine, 400 parts.

Soak the gelatine in the water and apply a gentle heat till dissolved, and then add the chloral.—*American Amateur Photographer.*

Gilding Letters.—When the sign is prepared as smooth as possible, go over it with a sizing made by white of an egg dissolved in about four times its weight of cold water, adding a small quantity of fuller's earth; this to prevent the gold sticking to any part but letters. When dry, set out the letters and commence writing, laying on the size as thinly as possible, with a sable pencil. Let it stand until you can hardly feel a slight stickiness; then go to work with your gold leaf knife and cushion and gild the letters. Take a leaf upon the point of your knife, after giving it a slight puff into the back part of your cushion, and spread it on the front part of it as straight as possible; give it another slight puff with your mouth to flatten it out. Now cut it to the proper size, cutting with the heel of your knife forward. Now rub the tip of the knife lightly on your hair; take up the gold on the point, and place it neatly on the letters; when they are all covered, get some very fine cotton wool, and gently rub the foil until it is smooth and bright. Then wash the sign with clean water to take off the egg size.

Gilding Without a Battery. Improved Process of.—We find the following in the *Zeitschrift fuer angewandte Mikroskopie:* In 1,000 parts of distilled water dissolve in the following order:

Crystalline sodium pyrophospnate, 80 parts; 12 per cent. solution of hydrocyanic acid, 8 parts; crystalline gold chloride, 2 parts.

Heat to a boiling temperature, and dip the article, previously thoroughly cleaned, therein.

Ginger Ale Extract.—1. Jamaica ginger, coarse powder, 4 oz.; mace, powder, ½ oz.; Canadian snakeroot, coarse powder, 60 grn.; oil of lemon, 1 fl. drm.; alcohol, 12 fl. oz.; water, 4 fl. oz.; magnesium carbonate or purified talcum, 1 av. oz.

Mix the first four ingredients, and make 16 fl. oz. of tincture with the alcohol and water, by percolation. Dissolve the oil of lemon in a small quantity of alcohol, rub with magnesia or talcum, add gradually with constant trituration the tincture, and filter. The extract may be fortified by adding 4 av. oz. of powdered grn. of paradise to the ginger, etc., of the above before extraction with alcohol and water.

2. Capsicum, coarse powder, 8 oz.; water, 6 pt.; essence of ginger, 8 fl. oz.; diluted alcohol, 7 fl. oz.; vanilla extract, 2 fl. oz.; oil of lemon, 20 drops; caramel, 1 fl. oz.

Boil the capsicum with water for three hours, occasionally replacing the water lost by evaporation, filter, concentrate the filtrate on a hot water bath to the consistency of a thin extract, add the remaining ingredients and filter.

3. Jamaica ginger, ground, 12 oz.; lemon peel, fresh, cut fine, 2 oz.; capsicum, powder, 1 oz.; calcined magnesia, 1 oz.; alcohol, water, of each sufficient.

Extract the mixed ginger and capsicum by percolation so as to obtain 16 fl. oz. of water, set the mixture aside for twenty-four hours, shaking vigerously from time to time, then filter, and pass through the filter enough of a mixture of two volumes of alcohol and one of water to make the filtrate measure 32 fl. oz. In

the latter macerate the lemon peel for seven days and again filter.

Ginger Beer, Fermented.—For a good recipe for fermented ginger beer to put up in stone jugs, take best Jamaica ginger, ground, 1 lb.; tartaric acid, 6 oz.; gum arabic, 1 lb.; oil lemon, ½ oz.; sugar, 21 lb.; water 21 gal.; yeast, ½ pt.

Stir the ginger, sugar and water very thoroughly together. Dissolve the gum in sufficient water to give it the consistency of cream; to this add the lemon oil, and shake them well together. Add this mixture to the sugar solution. Now stir in the yeast. As soon as a brisk fermentation is established, strain through a jelly bag. Let it work for another day or two and then bottle. This will make 20 gal.; you can double or quadruple the proportions if you want to make a larger batch.

Glass Engraving. See **Engraving.**

Glass Etching. See **Etching.**

Glass, Production of Ground.—Lainer recommends the following process in the *Chemiker Zeitung:* Mix 240 c. cm. of commercial hydrofluoric acid of 1·258 specific gravity with 600 grm. of pulverized soda crystals, then dilute with 1,000 c. cm. of water. After standing for some time a sediment is formed, and over it a clear solution. The thoroughly cleaned glass pane is provided with a wax edge (prepared by kneading yellow wax with tallow, rosin and asphalt powder) and pre-etched with common hydrofluoric acid (1 : 10) for some minutes to obtain an absolutely clean glass surface. Then wash with water and wipe the plate with a clean, soft sponge until the surface is only slightly moist. Stir up the paste of the etching acid, and pour the mass ½ to 1 cm. high upon the pane. With this mixture a nice normal deadening is obtained after one hour. If the acid is old, having been used often, it may be made to act longer upon the plate of glass. The liquid is poured back into the vat, and the glass is rinsed off with water. Then the water is allowed to remain upon the pane until a skin, formed from the surface of the glass, can be removed with the finger or a brush. The strong deadening obtained by this method can be fixed to any desired degree of transparency by etching with hydrofluoric acid.

Gloss, Laundry. See **Laundry Gloss.**

Glues.—For many special glues see the body of this work.

Chromium Glue.—Glue, when combined with chromates and exposed to light, loses its solubility in water, and can, therefore, be used as a cement for articles exposed to moisture. The following is a suitable formula:

White glue.....	5 to 20 parts.
Water.....	20 parts.
Potassium bichromate.....	1 to 2 parts.
Water	10 parts.

Make solutions of the glue and potassium bichromate in separate portions of water, as indicated above (the glue being dissolved by heat); stir in the solution of bichromate; mix well, and then pour the mixture into tin boxes and allow it to congeal therein. For use, take a sufficient quantity of the glue, melt in a cup standing in boiling water; place a layer uniformly on the fractured surface, press them together and expose the articles to the sun for a few hours.

The Use of Chrome Glue Especially as Glass Cement.—Chrome glue is known to consist of a moderately strong gelatine solution (containing 5 to 10 per cent. of gelatine) to which about one part of acid chromate of potassium in solution is added to every five parts of gelatine. This mixture possesses the property of becoming insoluble by water through the action of sunlight under partial reduction of the chromic acid, a property which is advantageously utilized in photography. The author coated both fractures of a glass as uniformly as possible with the freshly prepared solution, pressed them together, and fixed them in this position with a cord. The cylinder glass was exposed to the sunlight, and was found to be firmly united after a few hours. Even hot water did not dissolve the oxidized chrome glue, and the fracture was scarcely noticeable. Valuable articles of glass, which would be disfigured by a thick cement joint, can be very nicely repaired in this manner.

In the production of waterproof textures chrome glue is likewise of use; at least, where a certain tightness is no drawback. The fabric, after having been put in a frame, only needs to be painted one to three times with the hot chrome glue, and then to be exposed to the sunlight or daylight.—*Prof. Schweizer in Textil Zeitung.*

Le Page's Liquid Glue.—In 1887 the statement was made in this journal that James R. Pringle, Gloucester, Mass., patented a process for the manufacture of chlorine and glue from salted fish skins, consisting in treating the latter with sulphuric acid and manganese dioxide and water, whereby chlorine is liberated, while the glue is obtained from the residue by expression. A correspondent of another pharmaceutical journal, residing at Gloucester, has made the statement that several thousand pounds of the skins of the cod and cusk are annually consumed by the above firm, and expresses the opinion that the glue is produced by boiling the skins, deprived of their salt, with water and then concentrating the liquid resulting. But something else besides is required; and as Le Page's glue contains no acid, the preservative may possibly be alcohol or boric acid.—*Western Druggist.*

Tableting Glue.—A screw press, with a piece of smooth board on the bottom and a block above to clamp and hold the paper, answers very well as a tableting press. After the paper is squared up and all edges even, place in the press and fasten securely. Apply tableting glue to the top edges by means of a flat bristle brush. Allow to remain in the press until glue is dry. The following formula makes a satisfactory glue for tableting paper:

Good clear cabinet glue, 4 oz.; acetic acid, 3 fl. oz.; water, 2 fl. oz.; glycerine, ½ fl. oz.; aniline (any color preferred), q. s.

Place the glue, acetic acid and water in a wide-mouth bottle or jar, set in a warm place and stir occasionally until glue is dissolved. If needed at once the process may be hastened by dissolving the glue by means of a water bath. Add the glycerine and enough of a solution of aniline in water to give the desired color. Should the glue become too thick, add a little water till the proper consistency is restored.

This preparation has the advantage of being easily made, and is always ready for use.

Printing to be tableted should be permitted to dry thoroughly at least twelve hours before being placed in the tableting press, otherwise it will "set off"—that is, partially transfer the impressions and soil the backs of the sheets.

Gold Paint, Liquid for.—1. Stir the fine metallic powder into copal varnish previously thinned down to the proper consistency with turpentine. 2. Brannt gives the following: Melt dammar with an alkaline carbonate and expose the melted, finely powdered mass for several months to a temperature of about 122° F. The alkaline resin thus obtained is dissolved in a hydrocarbon below 302° F. Any acid contained in the hydrocarbon is previously neutralized by the introduction of dry ammonia gas. The mixture of this lacquer with the bronze powder keeps for a long time. 3. Pour over 100 parts of dammar and a few pieces of glass in a bottle 900 parts of benzine. Pour off the solution from the fine sediment and glass and suspend in it 300 to 400 parts of bronze powder. Fill in small bottles. A gold paint or varnish may be made as follows: 1. Digest shellac, 16 parts; gum sandarac, mas-

tic, of each 3 parts; gum gamboge, 2 parts, all bruised, with alcohol, 144 parts. 2. Artificial alizarine or garancine is to be digested in a glass vessel in three times its weight of alcohol for twelve hours, and pressed and filtered. A solution of clear orange-colored shellac in alcohol is next filtered and evaporated until it has the consistency of sirup. The latter is now covered with a layer of tincture of garancine, which permeates it. The slight brownish tinge of this varnish—a tinge absent from gold—may be corrected by a tincture of saffron. 3. Pulverize 1 drm. of saffron and ½ drm. dragon's blood, and put them into 1 pt. of 90 per cent. alcohol; add 2 oz. of gum shellac and 2 drm. of socotrine aloes; dissolve the whole by gentle heat. Yellow-painted work varnished with this mixture will appear almost equal to gold.—*Pharmaceutical Era.*

Grape Juice and Wine, Manufacture of.—Unfermented wine, or grape juice, may be prepared by expressing the juice of ripe grapes and heating it in bottles to a temperature of 60° to 70° C. for fifteen minutes, the heat rendering the yeast cells and other fermenting agents inactive. The juice can then be kept in well closed bottles for several years without fermenting. To obtain the juice clear it must be filtered, an operation which is easily carried out, as the heating will have coagulated the mucilaginous substances causing turbidity. Filtration may be carried out immediately after heating the juice, or after some time; but in any case the filtered juice must be again heated in bottles to the same temperature originally applied, and then it will keep clear in well closed bottles for several years.—*Pharmaceutical Era.*

Grease Paints. See **Face Paints.**

Gum, Chewing. See **Chewing Gum.**

Hardening.—*Drills, to Harden.*—Dissolve zinc in commercial muriatic acid to saturation. Heat the drill to a dull red and dip it in the zinc chloride solution formed as above described. The solution should be made in the open air, as the fumes are very corrosive.

The steel must not be overheated or overworked, and the drill must be sharpened before hardening. Whenever it requires sharpening, it must be rehardened.

Turpentine alone, or with camphor added, is used as a lubricant. Flat drills must be used for drilling glass, hardened steel, and chilled iron. A drill hardened in this manner will perforate glass nearly as readily as brass.

Hardening Powder for Steel Tools.—*Die Zeitschrift fuer Maschinenbau und Schlosserei* is authority for the following process: Powdered stag's hoof, 500 parts; Peruvian bark, 500 parts; cooking salt, 250 parts; refined saltpeter, 150 parts; potassium cyanide, 150 parts; all powdered well, mixed and made into a paste with 1,000 parts of black soap. The tools are made red hot, the powder is applied, and the tools are next hardened. For tempering the following lead baths are recommended: Tin, 4 parts, lead, 7 parts; tin, 4 parts, lead, 8 parts; tin, 4 parts, lead, 14 parts; tin, 4 parts, lead, 19 parts; tin, 4 parts, lead, 48 parts; tin, 2 parts, lead, 50 parts.

Springs, Hardening of.—Above all, a variety of steel must be chosen which is suitable for the production of springs, a very tough quality with about 0·8 per cent. of carbon being probably the best. Any steel works of good reputation would no doubt recommend a certain kind of steel. In shaping a spring, forging and hammering should be avoided if possible. In forging an uneven treatment can scarcely be avoided; one portion is worked more than the other, causing tensions which, especially in springs, must be guarded against. It is most advantageous if a material of the thickness and shape of the spring can be obtained, which, by bending and pressing through, is shaped into the desired spring. Since this also entails a slight tension, a careful annealing is advisable, so as to prevent cracking or distorting in hardening. The annealing is best conducted with exclusion of the air, by placing the springs in a sheet iron box provided with a cover, smearing all the joints well up with loam. The heating may be done in a muffled furnace; the box, with contents, is, not too slowly, heated to cherry red, and then allowed to cool gradually, together with the stove. The springs must only be taken out when they have cooled off enough that they will give no hissing sound when touched by water. In order to uniformly heat the springs for hardening, a muffle furnace is likewise employed, wherein they are heated to chery heat. For cooling liquid, a mixture of oil, tallow and petroleum is employed. A mass consisting of fish oil, tallow and wax also renders good service, but one should see to it that there is a sufficient quantity of these cooling liquids, so that the springs may be moved about, same as when cooled in water, without causing an appreciable increase in the temperature of the liquid. In most cases too small a quantity of the liquid is responsible for the many failures in hardening. When the springs have cooled in the hardening liquid, they are taken out, dried off superficially, and the oil still adhering is burned off over a charcoal fire. This enables one to moderate the temper according to the duration of the burning off and to produce the desired elasticity. An even heating being of great importance in hardening springs, the electric current has of late been successfully employed for this purpose.—*Werkmeister Zeitung.*

Heading or Foam for Beverages.—If it is thought desirable to give an extra foam or "head" this formula will do: Take soap bark in coarse powder, 2 oz.; animal charcoal, 1 oz. Macerate 2 days in alcohol, 2 oz.; glycerine, 2 oz.; distilled water, 4 oz. Percolate to obtain 8 oz. of finished product. Quantity to be used, 2 drm. to the gallon of concentrated ginger ale.

Hektograph, Improved.—*Die Papier Zeitung* gives the following directions for making an improved "graph:" Soak 4 parts of best clear glue in a mixture of 5 parts pure water and 3 parts ammonia (presumably liquor ammonia) until the glue is thoroughly softened. Warm it until the glue is dissolved, and add 3 parts of granulated sugar and 8 parts of glycerine, stirring well and letting it come to the boiling point. While hot, paint it upon clean white blotting paper, with a broad brush, until the blotting paper is thoroughly soaked, and a thin coating remains on the surface. Allow it to dry for 2 or 3 days, and it is then ready for use. The writing or drawing to be copied is done with the usual aniline ink upon writing paper. Before transferring to the blotting paper, wet the latter with a sponge or brush and clean water, and allow it to stand one or two minutes. Place the written side down, and stroke out any air bubbles, and submit the whole to gentle pressure for a few moments; remove the written paper, and a number of impressions can then be taken in the ordinary way. When the impressions begin to grow weak, wet the surface of the "graph" again. This "graph" does not require washing off, but simply laying away for 24 to 36 hours, when the surface will be ready for a new impression.

Hektograph That Will Not Turn Rancid.—Carbolic acid is usually added to hektograph mixtures as a preservative. The following formula will be found to yield a satisfactory pad:

Gelatine	4 oz.
Glycerine	15 fl. oz.
Carbolic acid	½ fl. oz.
Water	15 fl. oz.

Add the water to the gelatine, and allow to soak until the mass is softened. Then dissolve

in the glycerine with the aid of heat; the heat should be maintained until most of the water is evaporated. The acid is added carefully before cooling sets in.—*American Druggist.*

Ice Cream.—*Cheap Ice Cream.*—Pure milk, 2 gal.; sugar, 2 lb.; corn starch, ¾ lb.; flavoring, as desired.

Dissolve the starch in a quart of the milk by the aid of heat, mix all together, continue to heat until slightly thickened; then flavor and freeze.

Chocolate Ice Cream.- Chocolate may be used with any of the preceding in the proportion of 4 to 8 oz. to a gallon of cream. The chocolate is dissolved in a separate portion of milk or cream and added to the other ingredients.

Custard Ice Cream.—Fresh milk, 2 gal.; granulated sugar, 2 lb.; eggs, 36; flavoring, as desired.

Beat the eggs thoroughly, and add the sugar, stirring up well together; put the milk on the fire and stir all the time until it boils; pour the milk into the sugar and egg mixture, stirring all the time; set on the fire and stir for a few moments until slightly thickened. Strain and cool, flavor and freeze.—*Druggist's Circular.*

Pure Ice Cream.—Pure cream, 2 gal.; sugar, 2 lb.; flavoring, as desired. Mix well and freeze.

Vanilla Ice Cream.—1. Milk, 1 gal.; sugar, 4 lb.; eggs, 4; rich cream, 6 qt.; vanilla extract, ½ oz.

Bring the milk to boiling, add the sugar, stirring all the time, and then set aside to cool. Beat thoroughly the whites and yolks of the eggs separately, add the cream and the flavor, mix with the sweetened milk and freeze as usual.

2. Cream, 2 gal.; milk, 2 qt.; condensed milk, 1 pt.; sugar, 4 lb.; gelatine, 1 oz.; flavoring, as desired.

Soak the gelatine in water for two or three hours, dissolve in the milk by aid of heat, add the other ingredients, stir well, and freeze.

3. Milk, 2 gal.; sugar, 4 lb.; flour, 4 oz.; eggs, 12; common salt, 1 drm.; flavoring, as desired.

Mix the flour, sugar, and salt with 1 qt. of the milk, add the eggs, which should be well beaten, and the flavoring; heat the milk to boiling, mix all together, boil for a few minutes, let cool, strain and freeze.

Inks.—*An Official Ink.*—The State of Massachusetts has an official ink for public records. A law providing for such an ink was passed four years ago upon the suggestion of the secretary of the commonwealth and the commissioner of records. They found that many of the public records were fading, among them the original manuscript of the State Constitution adopted in 1780. Earlier records, including the original charter of the colony, which is 152 years older than the Constitution, are mostly in a good state of legibility. It would appear that the colonial authorities gave attention to the matter of imperishable ink, undoubtedly using a fluid long tested in Great Britain.

With the freedom of the colonies came a certain carelessness, as many colors and varying permanence are apparent in later documents. Up to 1850 most of the ink was good. From that time the ink varied greatly, and a good part of it was poor, so public documents are fading out. Copies of the early records of Lexington deposited with the secretary of the commonwealth have become almost illegible.

The act passed a few years ago made the secretary, as chief recording officer, responsible for the ink to be used for records in the commonwealth, and he took steps to find a suitable fluid for the purpose. The tests employed are described as follows by *The Boston Globe*, from an interview with the secretary:

"The acceptable ink had to be able to withstand the action of the sun's rays behind a glass covering for three months.

"Then it was decided that a severer test than that should be applied.

"The ink had to withstand for three months not only the action of the sun shining through glass, but to withstand for six months, without any protection whatever, the action of the elements.

"And before this test was applied, the paper containing the ink had been soaked in water, and then in alcohol and then in alcohol and water, to determine whether the color would fade or spread.

"Strange as it may seem, an ink was found that would withstand all these tests. It could be scorched by the heat and wet by the rain for six months, and also subjected all that time to every change of atmospheric temperature, and it would still be unchanged in strength and color on the paper."

An ink that met these requirements was purchased and supplied at a fair price to the record officers of the State. The formula of the ink was a requisite of the contract with the makers, and the secretary publishes it:

"Take of pure, dry tannic acid, 23·4 parts by weight.

"Of crystal gallic acid, 7·7 parts.

"Of ferrous sulphate, 30·0 parts.

"Of gum arabic, 10·0 parts.

"Of diluted hydrochloric acid, 25·0 parts.

"Of carbolic acid, 1·0 part.

"Of water, sufficient to make up the mixture at the temperature of 60° F. to the volume of 1,000 parts by weight of water."

Indelible Ink.—So-called indelible ink for marking cotton or linen is usually made from a salt of silver, the mark in this case being black. The nitrate is taken as a base and alkalies are added. A mixture of this kind, in which sodium hydrate (caustic soda) was used, exploded with great violence, and explosions are reported of other similar inks, the precise formulas of which we do not know. This accident has fortunately been rare, and unfortunately lacks convincing explanation, so that it is not clear as to what precautions or modifications are necessary.

In view of the difficulty it would be as well to try the following:

1. Woodhouse's Indelible Ink.—Nitrate of silver, 1 oz.; infusion of nutgalls, 2 drm.; gum arabic, 2 drm.; water, 8 oz.

Dissolve the nitrate of silver in 4 oz. of water. In the remainder of the water dissolve the acacia and add the infusion. Then mix the two liquids.

The infusion of nutgalls is made by pouring 1 oz. of boiling water upon 30 grn. of powdered nutgalls.

A more modern and presumably cheaper indelible ink is made by the following formula, which is not so convenient, however, in use, as will be seen by the directions.

2. Indelible Ink Without Silver.—A. Anilin hydrochlorate, 20 parts; mucilage of gum arabic, 25 parts; glycerin, 15 parts; water, 100 parts. B. Copper chloride, 3 parts; sodium chlorate, 3 parts; ammonium chloride, 2 parts; water, 40 parts.

Mix equal parts of the two solutions just before wanted for use.

By pressing the writing with a hot iron, the development of a black color is hastened.

3. Red Indelible Ink.—It is said that by proceeding according to the following formula, an intense purple-red color may be produced on fabrics which is indelible in the customary sense of the word:

I. Sodium carbonate, 3 drm.; gum arabic, 3 drm.; water, 12 drm.

II. Platinic chloride, 1 drm.; distilled water, 2 oz.

III. Stannous chloride, 1 drm.; distilled water, 4 drm.

Moisten the place to be written upon with No. I and rub a warm iron over it until dry; then write with No. II, and, when dry, moisten with No. III. An intense and beautiful purple-red color is produced in this way.

A very rich purple color—the purple of Cassius—may be produced by substituting a solution of gold chloride for the platinic chloride in the above formula.—*Druggist's Circular.*

Shading Inks.—1. Paris violet, 2 parts; water, 6 parts; mucilage acacia, 2 parts.

2. Rosaniline acetate, 2 parts; alcohol, 1 part; water, 10 parts; mucilage acacia, 2 parts.

3. Bordeaux red, 3 parts; alcohol, 2 parts; water, 20 parts; mucilage acacia, 2 parts.

4. Methyl violet, 1 part; distilled water, 7 parts; mucilage acacia, 2 parts.

5. Water-soluble nigrosine, 1 part; water, 9 parts; mucilage acacia, 1 part.—*Merck's Report.*

Stencil Ink.—Shellac, 2 oz.; borax, 2 oz.; acacia, 2 oz.; water, a sufficient quantity.

Boil the shellac and borax together with sufficient water to effect solution; then add the gum and sufficient lampblack or other pigment to give the desired color. The thickness of the ink is regulated by the amount of water used, of course.

Typewriter Copying Ink.—Transparent soap, 1 oz.; glycerine, 4 fl. oz.; water, 12 fl. oz.; alcohol, 24 oz.; aniline dye, a sufficient quantity.

Dissolve the soap in the water and glycerine with the aid of heat; dissolve the coloring matter in the alcohol, and mix the two solutions. If the ink is too soft, add more soap.

Ink Erasers. See **Cleansing.**

Insect Bites, Remedies for.—1. Carbolic acid, 15 grn.; glycerine, 2 drm.; rose water, 4 oz.

2. Salicylic acid, 15 grn.; collodion, 2½ drm.; spirit of ammonia, 5½ drm.

3. Fld. ext. Rhus toxicodendron, 1 drm.; water, 8 oz.

4. Ipecac, in powder, 1 drm.; alcohol, 1 oz.; ether, 1 oz.

Iron, to Color. See **Coloring.**

Ivory, to Distinguish.—To distinguish true ivory from the so-called vegetable ivory it is recommended (*Apoth. Zeit.*) to treat a sample for 12 to 15 minutes with concentrated sulphuric acid. Under these conditions true ivory retains its white appearance, while vegetable ivory from Phytelephus macrocarpa assumes a rose color, which may be removed by washing with water.—*Druggist's Circular.*

Ivory, New Imitation.—1. One of the disadvantages of celluloid is the fact that it burns very readily when a flame is applied; but a new compound, said to be fireproof, and suitable as a substitute for ivory, is thus made: A solution is prepared of 200 parts of casein in 50 parts of ammonia and 400 of water, or 150 parts of albumen in 400 of water. To the solution the following are added: Quicklime, 240 parts; acetate of alumina, 150 parts; alum, 50 parts; sulphate of lime, 1,200 parts; oil, 100 parts. The oil is to be mixed in last. When dark objects are to be made, from 75 to 100 parts of tannin are to be substituted for the acetate of alumina. When the mixture has been well kneaded together, and made into a smooth paste, it is passed through rollers to form plates of the desired shape. These are dried and pressed into metallic moulds previously heated, or they may be reduced to a very fine powder, which is introduced into heated moulds and submitted to a strong pressure. The objects are afterward dipped into the following bath: Water, 100 parts; white glue, 1 part; phosphoric acid, 10 parts. Finally, they are dried, polished, and varnished with shellac.

Jams and Jellies.—*Apple Jam.*—To every pound of fruit, weighed after being pared, cored and sliced, allow ¾ lb. of preserving sugar, the grated rind of a lemon, the juice of half a lemon.

Peel the apples, core and slice them very thin, and be particular that they are all of the same sort. Put them into a jar, stand this in a saucepan of boiling water, and let the apples stew until quite tender. Previously to putting the fruit into the jar, weigh it, to ascertain the proportion of sugar that may be required. Put the apples into a preserving pan, crush the sugar to small lumps, and add it, with the grated lemon rind and juice, to the apples. Simmer these over the fire for half an hour, reckoning from the time the jam begins to simmer properly; remove the scum as it rises, and when the jam is done, put it into pots for use. Place a piece of oiled paper over the jam, and to exclude the air, cover the pots with tissue paper dipped in the white of an egg, and stretched over the top. This jam will keep good for a long time. Time: About 2 hours to stew in the jar; ½ hour to boil after the jam begins to simmer.

Apple Jelly.—To 6 lb. of apples allow 3 pt. of water; to every quart of juice allow 2 lb. of loaf sugar; the juice of half a lemon.

Pare, core and cut the apples into slices, and put them into a jar, with water in the above proportion. Place them in a cool oven, with the jar well covered, and when the juice is thoroughly drawn, and the apples are quite soft, strain them through a jelly bag. To every quart of juice allow 2 lb. of loaf sugar, which should be crushed to small lumps and put into a preserving pan with the juice. Boil these together for rather more than half an hour, remove the scum as it rises, add the lemon juice just before it is done, and put the jelly into pots for use. This preparation is useful for garnishing sweet dishes, and may be turned out for dessert. Time: The apples to be put in the oven over night, and left till morning; rather more than ½ hour to boil the jelly. Sufficient for 6 small pots of jelly.

Cherry Jam.—To every pound of fruit, weighed before stoning, allow ½ lb. of sugar; to every 6 lb. of fruit allow 1 pt. of red-currant juice, and to every pint of juice 1 lb. of sugar.

Weigh the fruit before stoning, and allow half the weight of sugar; stone the cherries, and boil them in a preserving-pan until nearly all the juice is dried up; then add the sugar, which should be crushed to powder, and the currant-juice, allowing 1 pt. to every 6 lb. of cherries (original weight), and 1 lb. of sugar to every pint of juice. Boil all together until it jellies, which will be in from 20 minutes to half an hour; skim the jam well, keep it well stirred, and, a few minutes before it is done, crack some of the stones and add the kernels; these impart a very delicious flavor to the jam.

Time: According to the quality of the cherries, from ¾ to 1 hour to boil them; 20 minutes to ½ hour with the sugar. One pint of fruit for a pound pot of jam.

Black-Currant Jam.—To every pound of fruit, weighed before being stripped from the stalks, allow 1 lb. of loaf sugar, 1 gill of water.

Let the fruit be very ripe, and gathered on a dry day. Strip it from the stalks and put it into a preserving-pan; boil these together for 10 minutes; then add the sugar, and boil the jam again for 45 minutes, reckoning from the time when the jam simmers equally all over, or longer should it not appear to set nicely when a little is poured on to a plate. Keep stirring it to prevent it from burning, carefully remove all the scum, and when done pour it into pots. Let it cool; cover the top of the jam with oiled paper, and the tops of the jars with a piece of tissue paper brushed over on both sides with the white of an egg; this, when cold, forms a hard, stiff cover and perfectly excludes the air. Great attention must be paid to the stirring of this jam, as it is very liable to burn on account of the thickness of the juice.

Black-Currant Jelly.—Black currants; 1 lb. of loaf sugar. Strip the currants from the stalks, which may be done in an expeditious manner by holding the bunch in one hand and passing a small silver fork down the currants; they will then readily fall from the stalks. Put them into a jar, place this jar in a saucepan of boiling water, and simmer them until their juice is ex-

tracted; then strain them, and to every pint of juice allow the above proportion of sugar and water; stir these ingredients together cold until the sugar is dissolved; place the preserving-pan on the fire and boil the jelly for about half an hour, reckoning from the time it commences to boil all over, and carefully remove the scum as it rises. If the jelly becomes firm when a little is put on a plate, it is done; it should then be put into small pots and covered the same as Black-Currant Jam. If the jelly is wanted very clear, the fruit should not be squeezed dry; but, of course, so much juice will not be obtained. If the fruit is not much squeezed, it may be converted into a jam for immediate eating, by boiling it with a little common sugar; this answers very well for a nursery preserve.

Time: About ¾ hour to extract the juice; ½ hour to boil the jelly. From 3 pt. to 2 qt. of fruit should yield a pint of juice.

Red-Currant Jam.—To every pound of fruit allow ¾ lb. of loaf sugar. Let the fruit be gathered on a fine day; weigh it, and then strip the currants from the stalks; put them into a preserving-pan with sugar in the above proportion; stir them, and boil them for about three-quarters of an hour. Carefully remove the scum as it rises. Put the jam into pots, and, when cold, cover with oiled papers; over these put a piece of tissue paper brushed over on both sides with the white of an egg; press the paper round the top of the pot, and, when dry, the covering will be quite hard and air-tight.

Time: Three-quarters hour, reckoning from the time the jam boils all over. Allow from 6 to 7 qt. of currants to make 12 one-pound pots of jam.

Currant and Raspberry Jam.—To every pound of red currants allow ¼ lb. of raspberries, weighed after the stalks are removed, and 1 lb. of loaf sugar. Place the fruit in the above proportion in the preserving-pan, with 1 lb. of sugar to every pound of fruit, stir and boil for three-quarters of an hour after the mixture boils fast; remove the scum as it rises. Put the jam into pots, and cover as in Red-Currant Jam.

Time: Three-quarters hour; 6 to 7 qt. of fruit to make 12 one-pound pots of jam.

Red-Currant Jelly.—Red currants; to every pint of juice allow ¾ lb. of loaf sugar. Have the fruit gathered in fine weather; pick it from the stalks, put it into a jar, and place this jar in a saucepan of boiling water over the fire, and let it simmer gently until the juice is well drawn from the currants; then strain them through a jelly-bag or fine cloth, and, if the jelly is washed very clear, do not squeeze them too much, as the skin and pulp from the fruit will be pressed through with the juice, and so make the jelly muddy. Measure the juice, and to each pint allow three-quarters of a pound of loaf sugar; put these into a preserving-pan, set it over the fire, and keep stirring the jelly until it is done, carefully removing every particle of scum as it rises, using a wooden or silver spoon for the purpose, as metal or iron ones would spoil the color of the jelly. When it has boiled from twenty minutes to half an hour, put a little of the jelly on a plate, and if firm when cool, it is done. Take it off the fire, pour it into small gallipots, cover each of the pots with an oiled paper, and then with a piece of tissue paper brushed over on both sides with the white of an egg. Label the pots, adding the year when the jelly was made, and store it away in a dry place. A jam may be made with the currants, if they are not squeezed too dry, by adding a few fresh raspberries and boiling all together with sufficient sugar to sweeten it nicely. As this preserve is not worth storing away, but is only for immediate eating, a smaller proportion of sugar than usual will be found enough; it answers very well for children's puddings, or for a nursery preserve.

Time: From ¾ to 1 hour to extract the juice; 20 minutes to ½ hour to boil the jelly.

Eight quarts of currants will make from 10 to 12 pots of jelly.

Note.—Should the above proportion of sugar not be sufficient for some tastes, add an extra ¼ lb. to every pint of juice, making altogether 1 lb.

White-Currant Jelly.—White currants; to every pint of juice allow ¾ lb. of good loaf sugar.

Pick the currants from the stalks and put them into a jar; place this jar in a saucepan of boiling water, and simmer until the juice is well drawn from the fruit, which will be in from three-quarters to one hour. Then strain the currants through a fine cloth or jelly-bag; do not squeeze them too much, or the jelly will not be clear, and put the juice into a very clean preserving-pan with the sugar. Let this simmer gently over a clear fire until it is firm, and keep stirring and skimming until it is done; then pour it into small pots, cover them, and store away in a dry place.

Time: Three-quarters hour to draw the juice; one-half hour to boil the jelly. From 3 pints to 2 quarts of fruit should yield 1 pint of juice.

Jellies. See **Jams** above.

Kerosene, Masking Odor of.—Various processes have been recommended for masking the odor of kerosene, such as the addition of various essential oils, artificial oil of myrbane, etc., but none of them seems entirely satisfactory. The addition of *amyl* acetate in the proportion of 10 grm. to the liter (1 per cent.) has also been suggested, several experimenters reporting very successful results therefrom. Some years ago Beringer proposed a process for removing sulphur compounds from benzine, which would presumably be equally applicable to kerosene. This process is as follows: Potassium permanganate, 1 oz.; sulphuric acid, ½ pt.; water, 3½ pt.

Mix the acid and water, and when the mixture has become cold pour it into a 2-gallon bottle. Add the permanganate and agitate until it is dissolved. Then add benzine 1 gal., and thoroughly agitate. Allow the liquids to remain in contact for twenty-four hours, frequently agitating the mixture. Separate the benzine and wash in a similar bottle with a mixture of: Potassium permanganate, ¼ oz.; caustic soda, ½ oz.; water, 2 pt.

Agitate the mixture frequently during several hours; then separate the benzine and wash it thoroughly with water. On agitating the benzine with the acid permanganate solution an emulsion-like mixture is produced, which separates in a few seconds, the permanganate slowly subsiding and showing considerable reduction. In the above process it is quite probable that the time specified (24 hours) is greatly in excess of what is necessary, as the reduction takes place almost entirely in a very short time. It has also been suggested that if the process were adopted on a manufacturing scale, with mechanical agitation, the time could be reduced to an hour or two.

Ketchups. See **Pickles, Etc.**

Koumys Substitute.—To prepare a substitute for koumys from cows' milk, the *Ap. Zeitung* gives the following directions: Dissolve 15 grm. (½ oz.) of grape sugar in 120 cubic centimeters (3 fl. oz.) of water. Mix 1·2 grm. (18 grn.) of well washed and pressed beer yeast with 60 cubic centimeters (2 fl. oz.) of cows' milk. Mix the two liquids in a champagne bottle, fill with milk, stopper securely, and keep for three to four days at a temperature not exceeding 10° C. (50° F.), shaking frequently. The preparation does not keep longer than four to five days.

Labels, Indelible, for Bottles.—To affix indelible labels on bottles an etching liquid is employed, which is produced as follows:

Liquid I, in one bottle.—Dissolve 36 grm. of

sodium fluoride in ⅛ liter of distilled water, and add 7 grm. of potassium sulphate.

Liquid II, in another bottle.—Dissolve zinc chloride, 14 grm., in ⅛ liter of distilled water, and add 65 grm. of concentrated hydrochloric acid.

For use mix equal parts together, and add a little dissolved India ink to render the writing more visible.

The mixing cannot, however, be conducted in a vessel. It is best to use a cube of paraffin which has been hollowed out.—*Zeitschrift für die Gesammte Kohlensaure Industrie.*

Lacquers.—*Bottle Lacquer.*—Black Lacquer for Coating Bottles.—Bottles, or other glass vessels, which it is desired to make impervious to light, may be coated, according to Ferd. Simand, with a black lacquer prepared in the following manner: Equal parts of asphalt and of boiled linseed oil are heated for one hour over a naked fire to about 200° C. (392° F.); then a sufficient quantity of lampblack, previously triturated with oil of turpentine, is added, to make a mixture, which, when mixed with ¼ to ⅓ its volume of oil of turpentine, will cover well. Usually, one coat is sufficient; in special cases, two coats may be required.

Silvered Articles, to Lacquer.—The parts are previously protected by a coating of whites of eggs, and the lacquer applied as usual when the sizing of eggs is dry.

Tin Plate, Lacquer for.—The following formulas have been recommended for giving a lacquer finish to tin plate:

1. Clean the tin plate carefully, and apply the following mixture with a brush: Dark copal lacquer, 3 parts; linseed oil, 1½ parts. Dry the plates. The lacquer will not crack or lose its luster if the tin plates are bent or hammered.

2. Alcohol, 1 qt.; shellac, 4 oz.; red saunders, 1 oz.; turmeric, 2 oz. Shake frequently for twenty-four hours, and bottle. Various colors can be given to the lacquer by adding Prussian blue, lakes, etc.

3. Red: Put 3 oz. of seed lac and 2 drm. aniline, color of shade to suit, into a pint of well rectified spirits. Let the whole remain for 14 days, but during that time agitate the bottle once a day at least. When properly combined, strain the liquid through muslin.

Brannt gives the following formulas:

Japan Flow for Tin.—1. Spirits of turpentine, 3 qt.; tolu balsam, 3 oz.; linseed oil, ¾ pt.; acetate of lead, 3 oz.; balsam of fir, 3 oz.; sandarac, 1½ lb.

Put the materials, except the turpentine, in a suitable vessel, place first over a slow fire, then increase the heat until all is melted. When a little cool, stir in the turpentine and strain. The japan is transparent, but may be colored if desired.

2. Melt 5 lb. Naples asphaltum, 12 oz. dark animé. Boil for about 2 hours in 1½ gal. linseed oil; then melt 1½ lb. dark amber and boil it with ½ gal. linseed oil; add this to the other and add driers. Boil for about 2 hours, or until the mass, when cooled, may be rolled into little pellets. Withdraw the heat, and thin down with 3 gal. of turpentine. The mass must be continually stirred to prevent boiling over.—*Pharmaceutical Era.*

Laundry Polish.—1. Melt 5 parts of stearic acid, add 5 parts of absolute alcohol, and triturate the mixture with 95 parts of wheat starch. Starch prepared with this mixture takes easily a fine polish. The polishing irons should be thoroughly cleaned immediately after use.

2. Spermaceti, 1¾ oz.; gum arabic, 1¾ oz.; borax, 1¾ oz.; glycerine, 4½ oz.; distilled water, 1½ pt.

Boil half the water, and add the borax and spermaceti to it. Separately dissolve the gum in the remainder of the water and glycerine. Strain and mix thoroughly with the warm mixture. This is a good gloss for cold water starch; a wineglass of it is used with 4 oz. of dry starch.

3. White wax, 2 oz.; spermaceti, 4 oz.; stearin, ½ oz.; ultramarine blue, 3 grn.

Melt together and let cool.

For doing up a dozen shirts, put a piece the size of a hazelnut in the hot starch and mix. The boiling water serves to emulsify the waxy substance of the mixture. Finish with a hot iron, the usual way.

Starch Polish.—4. Spermaceti, 1 oz.; borax, 1 oz.; starch, 4 oz.

Reduce the spermaceti to a fine powder by the aid of a little alcohol, and mix with the powdered borax and starch.—*Pharmaceutical Era.*

5. The *Seifenfabrikant* gives the following for polishing shirt bosoms, collars, etc.: Gum arabic, 4 parts; borax, 4 parts; glycerine, 6 parts; spermaceti, 3 parts; water, 60 parts.

Leather.—*English Oak Stain for Bottoms of Boots and Shoes.*—The process used by the best English shoe manufacturers to stain our hemlock and union sole, so that it shall resemble English oak, is simply as follows: Take equal quantities, say 1 oz., of borax and oxalic acid, and put in 1 qt. of water. Be sure the acid does not predominate, and in some cases a very little more of the borax will be better. Then, when the shoe goes to the finishers, after sandpapering the bottom, when dry, dampen down or wet the grain with this solution, and, when nearly dry, apply French chalk or pipe clay in the usual way. This brings out a white bottom, finely tinted with a shade of pink. If more yellow, and not so much red, is wanted, put in a little turmeric root or chrome yellow. Care must be taken that the sole is not afterward wet while in stock, or the hemlock color will come out again.

Linoleum, Dressing for.—A weak solution of beeswax in spirits of turpentine has been recommended for brightening the appearance of linoleum. Here are some other formulas:

1. Palm oil, 1 oz.; paraffine, 18 oz.; kerosene, 4 oz.

Melt the paraffine and oil, remove from the fire and incorporate the kerosene.

Polish.

2. Yellow wax, 1 oz.; carnauba wax, 2 oz.; oil turpentine, 10 oz.; benzine, 10 oz.

Melt the waxes carefully, add the oil and benzine, and stir until cold.

3. Yellow wax, 5 oz.; oil turpentine, 11 oz.; amber varnish, 5 oz.

Melt the wax, add the oil, and then the varnish. Apply with a rag.—*Pharmaceutical Era.*

Liquid Bronze. See **Colorings.**

Lubricants.—*Bicycle Oil.*—An excellent lubricating and burning oil is a mixture of equal parts of sperm oil and vaseline oil, or 1 part of the first and 2 of the second, if a lot is wanted for the money. In the following form the oil may be called

Cyclists' Universal Oil.—Camphorated oil., 1 oz.; sperm oil, 3 oz.; vaseline oil, 4 oz. Mix.

This is "an oil for lamps, for lubricating bearings, and as an application for bruises or sprains. In the last case, if the skin is unbroken, pour some of the oil upon the palm of the hand and rub it well on the spot for five minutes, kneading and working the muscle freely. If the skin is broken, smear the spot with the oil and tie a clean handkerchief round it." It is desirable to color the oil slightly with alkanet.—*Chemist and Druggist Diary.*

Malted Drinks.—*Malt With Coca.*—Fluid extract coca, 1 oz.; alcohol, 1 oz.; extract malt, to make 4 pt.

Malted Milk Sirup.—Malted milk, 8 oz.; hot water, 8 oz.; simple sirup, 4 pt.

Coca Malt Phosphate.—Extract of malt, 2 lb.; kola wine sirup, 3 pt.; coca wine sirup, 1 pt.;

cinchona wine sirup, 1 pt.; pure orange wine, 1 pt.; spirit of rose, ¼ fl. oz.; acid solution of phosphates, 8 fl. oz.

The kola wine sirup is made by adding 2 pt. of kola wine to 3 pt. of simple sirup. The coca wine sirup is made by adding 2 pt. of coca wine to 3 pt. of simple sirup.—*American Druggist.*

Mantles, Impregnating Liquid for Incandescent Gas Light.—According to *Invention*, M. Salomonov, of Russia, has received a patent on an impregnating liquid for incandescent gas light mantles which effects a coloring of the light. Same consists of magnesium sulphate, 12 parts (by weight); zinc sulphate, 4 parts; potassium bichromate, 1 part; or, in its stead, ammonium bichromate, 1 to 5 parts, dissolved in distilled water, 50 to 100 parts. To the solution are added some drops of a silver nitrate solution. The mantles are dipped in this liquid and dried. Such a mantle imparts to the light a pale red color, which can be intensified by the addition of a little stannic nitrate to the impregnating liquid. If an addition of platinum tetrachloride is substituted for the admixture of silver nitrate, the light will have a golden yellow color.—*Metallarbeiter.*

The mantles produced according to the following process are claimed to excel all former ones in strength and elasticity, or resistance to pressure, knocks and draught, while the luminous power is the largest possible.

The new process, invented and patented by George Kohl and Ritter von Theumar, of Vienna, differs from the customary modes of manufacture in that in the second impregnating fluid a mixture of the nitrates of uranium, chromium, or platinum, is substituted for the cerium or cerium nitrate.

For the first impregnation a solution of zinc nitrate, 2 grm.; stannic nitrate, 1·2 grm.; bismuth nitrate, 1 grm.; borax, 1 grm.; calcium nitrate, 2 grm., in 1 k. of water is employed.

After the drying of the impregnated mantles, which is best conducted at a gradually rising temperature, they are saturated by quick immersion into a solution of thorium nitrate, 400 grm.; barium nitrate, 0·04 grm.; strontium nitrate, 3·02 grm.; indium nitrate, 0·12 grm.; gallium nitrate, 0·04 grm.; samarium nitrate, 0·24 grm.; uranium nitrate, 0·30 grm.; chromium nitrate, 0·12 grm.; platinum nitrate, 0·1 grm. in 1 k. of water.

The gauze is now freed from an excess of the impregnating agent by means of a wringer and dried.

The fastening of the hangers, the burning off, etc., are conducted in the manner generally in use.

The mantles in a cold state possess a faintly yellow coloring, due to the uranium and chromium, which is not at all disturbing. They are very resistive to knocks and concussions. The nets are woven more closely at the end where they are suspended, so that the customary re-edging becomes unnecessary.—*Neueste Erfindungen und Erfahrungen.*

Marble.—*Artificial.*—According to M. Maard, artificial marble may be produced in the following manner: 10 parts of burnt gypsum and 1 part of alum are mixed together in a little water. This is then calcined and afterward reduced to a powder. To 25 parts of the powder is added 22 parts of talc, 5 parts of magnesium chloride, 44 parts of clay, and 1 part of potassic alum. This mixture can be worked, polished, or painted similar to marble.

Marble, to Clean. See **Cleansing.**

Marmalade, Orange.—1. Equal weight of fine loaf sugar and oranges; to 12 oranges allow 1 pt. of water.

Let there be an equal weight of loaf sugar and oranges, and allow the above proportion of water to every dozen oranges. Peel them carefully, remove a little of the white pith, and boil the rinds in water 2 hours, changing the water three times to take off a little of the bitter taste. Break the pulp into small pieces, take out all the pips, and cut the boiled rind into chips. Make a syrup with the sugar and water; boil this well, skim it, and when clear, put in the pulp and chips. Boil all together from 20 minutes to ½ an hour; pour it into pots; and, when cold, cover down with bladders or tissue paper brushed over on both sides with the white of an egg. The juice and grated rind of 2 lemons to every dozen of oranges, added with the pulp and chips to the syrup, are a very great improvement to this marmalade.

Time: 2 hours to boil the orange rinds; 10 minutes to boil the syrup; 20 minutes to ½ hour to boil the marmalade.

2. Equal weight of oranges and sugar; to every lb. of sugar allow ½ pt. of water.

Weigh the sugar and oranges, score the skin across, and take it off in quarters. Boil these quarters in a muslin bag in water until they are quite soft, and they can be pierced easily with the head of a pin; then cut them into chips about 1 in. long, and as thin as possible. Should there be a great deal of white stringy pulp, remove it before cutting the rind into chips. Split open the oranges, scrape out the best part of the pulp, with the juice, rejecting the white pith and pips. Make a syrup with the sugar and water; boil it until clear; then put in the chips, pulp, and juice, and boil the marmalade from 20 minutes to ½ an hour, removing all the scum as it rises. In boiling the syrup, clear it carefully from the scum before the oranges are added to it.

Time: 2 hours to boil the rinds; 10 minutes the syrup; 20 minutes to ½ hour the marmalade.

Orange Marmalade Made with Honey.—To 1 qt. of the juice and pulp of Seville oranges allow 2 lb. of honey, 1 lb. of the rind. Peel the oranges and boil the rind in water until tender, and cut it into strips. Take away the pips from the juice and pulp, and put it, with the honey and chips, into a preserving pan; boil all together for about half an hour, or until the marmalade is of the proper consistency; put into pots and, when cold, cover down with bladders.

Time: 2 hours to boil the rind; ½ hour the marmalade.

Matches, Manufacture of.—Each factory uses its own method and chemical mixtures, though, in a general way, the latter do not vary greatly. It is impossible here to give a full account of the different steps of manufacture, and of all the precautions necessary to turn out good, marketable matches. However, in the manufacture of the ordinary safety match, the wood is first comminuted and reduced to the final shape, and then steeped in a solution of ammonium phosphate (2 per cent. of this salt with 1 or 1½ per cent. of phosphoric acid), or in a solution of ammonium sulphate (2½ per cent.), then drained and dried. The object of this application is to prevent the match from continuing to glow after the match has been burned out. Next the matches are dipped into a paraffine or stearine bath, and after that into the match bath proper, which is best done by machines constructed for the purpose. Here are two formulas for the "composition:"

1. Potassium chlorate	2,000 parts.
Lead binoxide	1,150 parts.
Red lead	2,500 parts.
Antimony trisulphide	1,250 parts.
Gum arabic	670 parts.
Paraffine	250 parts.
Potassium bichromate	1,318 parts.
2. Potassium chlorate	2,000 parts.
Lead binoxide	2,150 parts.
Red lead	2,500 parts.
Antimony trisulphide	1,250 parts.
Gum arabic	670 parts.
Paraffine	250 parts.

Rub the paraffine and antimony trisulphide

together, and then add the other ingredients. Enough water is added to bring the mass to a proper consistency when heated. Conduct heating operations on a water bath. The sticks are first dipped in a solution of paraffine in benzine and then are dried. For striking surfaces mix 9 parts red phosphorus, 7 parts pulverized iron pyrites, 3 parts pulverized glass, and 1 part gum arabic or glue, with water, q. s. To make the matches water or damp proof, employ glue instead of gum arabic in the above formulas, and conduct the operations in a darkened room. For parlor matches dry the splints and immerse the ends in melted stearine. Then dip in the following mixture and dry: Red phosphorus, 3 parts; gum arabic or tragacanth, 0·5 part; water, 3 parts; sand (finely ground), 2 parts; lead binoxide, 2 parts. Perfume by dipping in a solution of benzoic acid. —*Pharmaceutical Era.*

A New Match.—M. O. Lindner, of Paris, has recently patented a match which may be lighted by friction upon any surface whatever, and which possesses the advantages of being free from danger and of emitting no unpleasant odor. The mixture into which the splints are first dipped consists of: Chlorate of potash, 6 parts; sulphide of antimony, 2 parts; gum, 1½ parts; powdered clay, 1½ parts. The inflammable compound consists of: Chlorate of potash, 2 to 3 parts; amorphous phosphorus, 6 parts; gum, 1½ parts; aniline, 1½ parts.

Matches Without Phosphorus.—The following is the same as the well-known U. and P. matches and does not require a separate rubber or prepared surface: Potassium chlorate, 26 oz.; manganese, black oxide, 25 oz.; potassium bichromate, 20 oz.; lead cyanide, 20 oz.; antimony oxysulphide, 20 oz.; glass powder, 4 oz.

These substances are first powdered separately and then gradually mixed into a solution of 1 lb. gum in 4 lb. water, to form a thick, smooth paste; with this paste the dry wood splinters are tipped, and after about 18 hours' exposure to the air in a drying room, kept at about 80° Fah., the matches are ready for boxing. To render the matches non-absorbent of moisture or waterproof, they are momentarily dipped into a liquid composed of: Shellac, best white, 1 lb.; alcohol, or wood naphtha, 1 qt.; digested together in a closed vessel for several days with occasional agitation, then strained through fine linen cloth. Use red lead to color.

New Composition for Matches.—Messrs. Sevene & Cohen, engineers of the French State manufactories, have recently succeeded in producing matches with a phosphoric combination that is less deleterious than the one that has hitherto been employed. The period of trial terminated some time ago, and for a few months past all of the manufactories of France have been using nothing but the new composition.

The substance recommended by Messrs. Sevene & Cohen is sesquisulphide of phosphorus, which has all the advantages of white phosphorus without the drawbacks of the latter. It is obtained through the combination of amorphous phosphorus and sulphur. It cannot be obtained in starting with white phosphorus, and so it can contain as impurities only red phosphorus and water. It melts at 142° and emits no vapors at ordinary temperatures; and neither odor nor smoke is observed in the works where the product is used. The toxicity of the substance is quite feeble. Messrs. Sevene & Cohen gave repeated doses of 3 c. grm. per day to guinea pigs without the latter appearing to suffer therefrom. This corresponds for an adult of medium size to 3·5 grm., that is to say, to the weight of sesquisulphide contained in 6,000 matches.

In order to give the matches the necessary degree of inflammability, a certain proportion of chlorate of potash must always be added to the paste. The following is the composition of the paste at present employed and which permits of the manufacture of a new type of paraffined wooden matches that will ignite upon any surface whatever upon which they are struck: Sesquisulphide of phosphorus, 6 parts; chlorate of potash, 24 parts; zinc white, 6 parts; red ocher, 6 parts; powdered glass, 6 parts; glue, 18 parts; water, 34 parts.

The composition varies slightly according as the paste is designed for sulphur, paraffined, or wax matches. Not only is this product free from the inconveniences of white phosphorus, but the process of manufacture remains sensibly the same.

Parlor Match Composition. — For parlor matches dry the splints and immerse the ends in melted stearine. Then dip in following mixture and dry: Phosphorus (red), 3 parts; gum arabic or tragacanth, 0·5 part; water, 3 parts; sand (finely ground), 2 parts; lead binoxide, 2 parts.

Perfume by dipping in a solution of benzoic acid.

Mildew, to Remove. — Mildew is the hardest of all stains to remove, and cannot be taken out of linen unless the effort is made soon after it appears. A very fresh, light stain may be treated successfully by covering it with table salt wet with lemon juice, and placing it on the grass in the sun. But the best remedy is the following: Mix soft soap with powdered starch, half as much table salt, and the juice of a lemon. Spread this mixture thickly on both sides of the mildewed linen, and then lay the fabric on the grass in the sun. Repeat the operation two or three times a day, leaving the cloth out overnight as is done in bleaching. If this will not remove the stain, nothing will do it.

Preservation of Fishing Nets.—The *Allgemeine Fischereizeitung* gives the following receipts for the preservation of fishing nets, which are, of course, also applicable to ropes, etc., in contact with water. Some have been subjected to a long test by the Drontheimer Fischerei Gesellschaft. 1. For 40 k. of cord, hemp or cotton, 3 k. of cutch, 1 k. of blue vitriol, ½ k. of potassium chromate, and 2½ k. of wood tar are required. The cutch is boiled with 150 l. of water until dissolved, and then the blue vitriol is added. Next, the net is entered and the tar added. The whole should be stirred well, and the cordage must boil 5 to 8 minutes. Now take out the netting, lay it in another vessel, cover up well, and leave alone for 12 hours. After that it is dried well, spread out in a clean place, and coated with linseed oil. Not before 6 hours have elapsed should it be folded together and put into the water. The treatment with linseed oil may be omitted. 2. Dissolve 1 k. of blue vitriol in water. Immerse the net, which must be perfectly dry, in the solution for 24 to 28 hours. This treatment must be repeated every three or four weeks.

Impregnating Cotton Sailcloth.—Sailcloth, allowed to lie about in wet condition or rolled up wet, will begin to rot, and we know that the spots cannot afterward altogether be removed by washing, and not even by chlorine. If dried in the stretched condition, the cloth will not spoil. This can be done on a fully manned boat, but not always on other crafts. Soap and brush, applied at once, will do some good. There is also a mistaken idea that rinsing with fresh water and drying in the sun will prevent mischief. To avoid all trouble the sailcloth should be impregnated. How this is done is described by Edward Gruene in *Lehne's Faerber Zeitung.* The weaver's glue has first to be removed, which is accomplished by boiling a roll of about six pieces in malt, or also in caustic soda. In the latter case every packet must have a fresh lye, but the subsequent washing in dilute hydrochloric acid does not call for a renewal of the bath every time. The cloth is dried hanging, as in all subsequent operations; there is more shrinkage on a cylinder. For impregnation a solution of

alum and phenylate of lime is recommended. The impregnated cloth passes between two rolls, the upper of metal, the lower of paper. Finally comes the fixing with soda silicate. Gruene has found the treatment to answer well, and the cloth remains soft. If, after two years or so, a repetition of the impregnation should appear advisable, the cloth may simply be dipped in phenylate of aluminum.

Milk, Dried.—Dried milk is one of the most recent results of food industry. It is a yellowish powder, presenting the appearance of coarse rye flour. According to the manufacturers, it gives a product resembling fresh milk when mixed with water in proper proportions. Chemical analysis shows that the water is reduced from about 88 to about 3 per cent. in this powder. Its composition is as follows:

Total solid matter, 95 per cent.; albumen, 25 per cent.; fat, 24 to 25 per cent.; ash, 5·7 per cent.; milk sugar, 40 per cent.

It represents ten times its weight of fresh milk, and may be used advantageously in coffee, cocoa, etc.—*Sudd. Ap. Zeitung.*

Milk, Detection of Formaldehyde in.—Denigés (*Jour. Phar. Chim.*) recommends the following method: To 10 c. cm. of milk add 1 c. cm. of fuchsine sulphurous acid, allow to stand five minutes; then add 2 c. cm. of pure hydrochloric acid and shake. If formaldehyde is not present, the mixture remains yellowish-white, while if present, a blue-violet color is produced. This test will detect 0·02 grm. of anhydrous formaldehyde in one liter of milk.

Moths, Insecticide for.—Carbolic acid, 10 grm.; oil of cloves, oil of lemon, camphor, of each, 5 grm.; alcohol (90 per cent.), 500 grm.

Nets, Mildew in. See **Mildew.**

Nursery Powders. See **Powders.**

Oil, Bicycle. See **Lubricants.**

Paint.—*Anti-corrosion.*—An anti-corrosion paint for iron. If 10 per cent. of burnt magnesia, or even baryta or strontia, is mixed cold with ordinary linseed oil paint, and then enough mineral oil to envelop the alkaline earth, the free acid of the paint will be neutralized, while the iron will be protected by the permanent alkaline action of the paint. Iron to be buried in damp earth may be painted with a mixture of 100 parts of rosin (colophony), 25 of guttapercha, and 50 of paraffin, to which 20 of magnesia and some mineral oil have been added.—*Neueste Erfind.*

Blackboard Covering, Bergmann's.—Prussian blue, chrome green, equal parts; gilder's sizing, alcohol, equal parts, sufficient.

Mix the powders and add sufficient of the liquid to the consistency of cream. Use large, stiff brush; cover quickly. In an hour's time give second coat. In a day or two smooth the surface with hair cloth.

This formula is communicated by Mr. C. H. Bergmann, principal of a Charleston, S. C., school, to the *Scientific American*, and he claims perfection for it. It gives a velvety surface which will never look gray, as that made with lampblack.

Red Paint Used on Magnets.—The "paint" used on magnets is usually non-conducting shellac varnish, carrying cinnabar. Try the following formula: Cinnabar, pulverized, 3 parts; Venice turpentine, 2 parts; shellac, pale, 1 parts; alcohol, 95 per cent., sufficient.

Melt turpentine and shellac, remove from fire, let cool down to about 140° F., and add 10 parts of the alcohol. Rub up the cinnabar with sufficient alcohol to make a paste, and add it to the melted mixture. Put on a water bath for a few minutes, and stir continuously, until a smooth, homogeneous fluid is obtained. Remove from fire, and stir until cold. Preserve in well-stoppered vials, and when desired for use return to the water bath, and heat until the liquid can be applied with a brush. The magnet should be warmed before applying.

Paper.—*Butter-Preserving Paper.*—Cooking salt, in fine powder, 160 gr.; saltpeter, in fine powder, 320 gr.; whites of 20 eggs.

Beat the albumen to a froth, mix the salts, and add the mixture to the froth, little by little, with constant stirring, until a solution is formed. In this soak a good quality of bibulous paper and hang it across strings to dry. When dry go over each sheet with a hot smoothing iron, the face of which is kept well waxed.—*Neueste Erfindungen und Erfahrungen.*

Carbon Paper.—1. A workable substitute for the carbon manifolding paper bought in the stationery stores may be made as follows:

Lard	12 grm.
Beeswax	2 grm.
Lampblack	2 grm.

Melt together the lard and wax, and pour gradually into a warm mortar, containing the lampblack, with constant trituration. Brush this mixture while still liquid over warm paper, and remove the excess with a flannel cloth.

2. *Permanently Moist Copying Paper.*—A perpetually damp copying paper, always ready for use, is described in *The Paper Trade Journal.* It is prepared by dissolving 1 lb. of chloride of magnesium in a moderate quantity of warm or cold water—about 1 lb. When dissolved, apply this solution with a brush to ordinary copying paper, whether in book form or otherwise, or preferably by means of cloth pads saturated with the liquid, then place these pads between any suitable number of leaves; apply pressure, at first very moderate, until the absorption by the paper is complete; then remove the cloth pads and apply with the press a strong pressure. It is then ready for use.

Paper prepared by this process will remain permanently moist under ordinary temperature, and if made dry by an extraordinary heat, will regain its moisture upon being subjected to the common atmosphere.

One advantage of this method is that the sheets of paper will not adhere to each other, as is frequently the case when the paper is prepared with compounds containing glycerine, etc. The above process is patented.

Fly Paper, Non-poisonous.—Prepare a strong decoction, or, better still, a tincture of quassia raspings, and add to it a warm mixture of 300 parts Venice turpentine, 150 parts of poppy seed oil and 60 parts of honey. This preparation should be spread thickly on strong paper.—*Pharm. Post.*

Moth Paper.—1. Carbolic acid, 1 oz.; ceresin, 1 oz.; naphthalin, 2 oz.

Melt, immerse pieces of bibulous paper, and dry these on plates.

2. Carbolic acid, 1 oz.; camphor, 1 oz.; benzine, to make 1 pt.

Saturate pieces of blotting paper, and apply, or use the liquid in the form of spray by means of an atomizer.—*American Druggist.*

Painted Paper.—Unsized paper is coated with an aqueous solution of dextrine. When this coat is dry, a layer of siccative oil paint is applied, and the sheet so obtained may be used for packing purposes, to render fabrics impermeable to water, etc.

Paper for Retaining Moisture.—Make a solution of potassium acetate or sodium acetate, and add to it either grape sugar, dextrine, or powdered starch. A little carbolic acid or salicylic acid should also be added to prevent chemical changes. Treat the paper with this solution after general directions.—*National Druggist.*

Pole-Indicating Paper, Electric.—Dissolve 1 to 2 grm. of phenol-phthalein in 10 c. cm. of alcohol of 90 per cent.; add 110 c. cm. of distilled water, and impregnating porous paper (blotting paper) with the milky solution. While the paper is still moist, draw it through a solution of 20 grm. of sodium sulphate in 100 c. cm. of distilled water. Dry at moderate heat and cut paper into narrow strips. For use, moisten

the paper, and place ends of wire on it at a distance of about ¼ inch to ½ inch. A red spot or strip will then appear at once at the negative pole.—*Prometheus.*

Salicylated Paper.—Divide any desired quantity of salicylic acid into two equal parts. Make a solution containing 3 parts of Glauber salt and 7 parts of borax in 58 parts of water, heat, and add one of the parts of salicylic acid. Digest the remaining half of the acid in a volume of hot glycerine about equal to that of the saline solution. Mix the two liquids and then carefully add water until a solution of about 3 per cent. of salicylic acid is obtained. This answers for thin paper, but a thicker paper requires a 5 per cent. solution. The best paper for the purpose is one having a satin finish. If the salts show a tendency to crystallize out on the paper on drying, more glycerine is needed. Each sheet should be put in separately and kept immersed for four or five minutes, the solution being maintained at a temperature of not less than 150° F. The paper should be dried at ordinary temperatures and kept pressed between pasteboard, or in rolls.—*National Druggist.*

Toughened Paper.—The French papers speak of a method of rendering paper extremely hard and tenacious by subjecting the pulp to the action of chloride of zinc. After it has been treated with the chloride, it is submitted to a strong pressure, thereafter becoming as hard as wood and as tough as leather. The material may be employed with advantage in covering floors, and it will also be found excellent for large sheets of roofing. It has long been known that paper already manufactured acquires the same consistency when plunged unsized into a solution of the chloride.

Papier Maché.—The following are the ingredients necessary to make a lump of papier maché a little larger than an ordinary baseball and weighing 17 oz.:

Wet paper pulp { dry paper, 1 oz. / water, 3 oz. } 4 oz. av'd'p
Dry plaster Paris..... 8 oz. av'd'p
Hot glue.....½ gill, or 4½ tablespoonfuls.

While the paper pulp is being prepared, melt some best Irish glue in the glue pot, and make it of the same thickness and general consistency as that used by cabinet makers. Measure the different ingredients to be used, until the result teaches you what good papier maché is like, and after that you can be guided by your judgment as you proceed. On taking the paper pulp from the water, give it a gentle squeeze, but by no means squeeze it as dry as you can. Now put it in a bowl, put over it 3 tablespoonfuls of your hot glue, and stir the mass up into a soft and very sticky paste. Next add your plaster of Paris and mix it thoroughly. By the time you have used about 3 oz. of the plaster, the mass is so dry and thick you can hardly work it. Now add the remainder of your glue, work it up again until it becomes sticky once more, then add the remainder of your plaster. Squeeze it vigorously through your fingers to thoroughly mix the mass, and work it until it is free from lumps, is finely kneaded and is sticky enough to stick fast to the surface of a planed board when you rub it a bit on it by firm pressure of the finger. If it is too dry to stick fast, add a few drops of either glue or water, it makes little difference which, and work it up again. When the paper pulp is poor and the maché is inclined to be lumpy, lay the mass upon a smooth board, take a hammer and pound it hard to grind it up fine.

If the papier maché is not sticky enough to stick fast to whatever a bit of it is rubbed upon, it is a failure and requires more glue. In using it the mass should be kept in a lump, and used as soon as possible after it is made. Keep the surface of the lump moist by means of a wet cloth laid over it, for if you do not, the surface will dry rapidly. If you wish to keep it over night, or longer, wrap it up in several thicknesses of wet cotton cloth, and put it under an inverted bowl. If it should by accident or delay become a trifle too stiff to work well, add a few drops of water to the mass, pound it with the hammer, and work it over again. If you wish to keep a lump for a week, to use daily, add a few drops of glycerine when you make it, so that it will dry more slowly.

The papier maché made when the above formula was prepared had the following qualities: When tested by rubbing between the thumb and finger, it was sticky and covered the thumb with a thin coating. (Had it left the thumb clean, it would have been because it contained too much water.) When rubbed upon a pane of glass it stuck tightly, and dried hard in three hours without cracking, and could only be removed with a knife. When spread in a layer as thin as writing paper, it dried in half an hour. A mass actually used dried hard enough to coat with wax in eighteen hours, and, without cracking, became as hard as wood; yet a similar quantity wrapped in a wet cloth and placed under an inverted bowl kept soft and fit for use for an entire week.

Such are the qualities of first-class papier maché, and the method of producing it.

Paste in Powdered Form.—Some years ago a patent was granted for an adhesive paste, consisting of a compound containing flour, starch, or other farinaceous substance, with an alkali, preferably caustic soda or caustic potash, or some other strongly alkaline substance. If the flour be mixed with any of these substances in the form of powder in the proper proportions, they form a compound which, when mixed with water, will soon assume the consistence of a paste, and will become soluble in water. The action of the alkali on the flour bursts the starch cells and digests or dissolves it, increasing its bulk and reducing it to a paste, which may be thinned by the addition of water, or thickened by the addition of more of the alkali and flour. These compounds are sold as powders, to be mixed with water by the user.

The following formula has been given:

Flour..... .....84 parts.
Caustic soda (pulverized)..... 8 parts.

In place of the caustic soda, pulverized caustic potash may be used. Other forms of alkali—such as strong soda ash—may also be used, but the quantity must be considerably increased until sufficient to digest the flour. It is preferably best to employ caustic soda.

A formula said to answer better for all purposes is the following modification of the above:

Flour, starch, other farinaceous substance..... 84 parts.
Pulverized caustic soda (or potash) ..... 8 parts.
Ammonium sulphate..... 8 parts.

To apply it to use, add to it a little water.

The ammonium sulphate is used as a neutralizing agent and counteracts the strong effects of caustic soda on colored or tinted papers.

Pasteurizing Milk. See **Milk.**

Pegamoid.—The following receipt for the mixture of a coating for bookbinder's pasteboard is said to be very similar to the composition of pegamoid: Camphor, 100 parts; mastic, 100 parts; bleached shellac, 50 parts; guncotton, 200 parts; acetone, 200 parts; acetic ether, 100 parts; ethylic ether, 50 parts.—*Papier Zeitung.*

Pencils, Black Lead for.—A correspondent of *The Pharmaceutical Era* has tried without success the following formula: 10 parts, by weight, of plumbago, 7 parts German pipe clay, made into a stiff paste and run

through a mould, and then bake in an oven (such as is used in baking emery wheels). The editor of that journal says: The successful production of pencil leads is a very valuable trade secret to the manufacturers of pencils. In a general way, it may be said that black lead for pencils is usually prepared by one or another of the following methods:

1. The blocks of plumbago are exposed to a bright red heat in a closely covered crucible, and are afterward sawed into minute sticks and mounted in cases of cedar or satin wood.

2. The plumbago, in powder, is calcined as before and then mixed with an equal or any other desired proportion of pure washed clay, also in powder, after which the mixture is reduced to a plastic state with water and pressed into grooves cut on the face of a smooth board, or into well greased wooden moulds, in which state it is left to dry. When dry, the pieces are tempered to any degree of hardness by exposing them, surrounded by sand or powdered charcoal, to various degrees of heat. The crucible is not opened until the whole has become cold, when the prepared "slips" are removed and mounted as before. This method was invented by M. Conte in 1795.

3. The dough or paste, prepared as last, is reduced to the required form by forcing it through a perforated plate (in a similar manner to that adopted for colored crayons) or into minute metallic cylinders, from which it may be readily shaken after it becomes partially dry. The leads for some varieties of drawing pencils are immersed for a minute in very hot melted wax or suet before mounting them. To the composition for others a little lampblack is added to increase and vary the degree of blackness.

Perfumes.—*Frozen or Solid Perfumes.*—In the first place, the solid perfume is merely perfumed hard paraffine. The hard paraffine is melted and perfumed at as low a temperature as possible, and for a mould use the lids of 2 drm. chip boxes.

White Rose Solid Perfume.—Oil of geranium, ½ drm.; oil of bergamot, ⅛ drm.; oil of patchouli, 5 min.

From 1 to 5 drops to each block may be used, according to the moderation or extravagance of the manufacturer.

Lavender Solid Perfume.—Oil of lavender, 2 oz.; essence of bergamot 1 oz.; oil of cassia, 5 min.; oil of geranium, 40 min.; oil of orange, 5 min. Mix and perfume the wax as before.

Bouquet Solid Perfume.—Oil of coriander, 18 min.; oil of cloves, 2 drm.; oil of nutmeg, 1 drm.; oil of lavender, 3 drm.; oil of sandal, 1 drm.; oil of bergamot, 1 oz.; otto of rose, ½ drm.; oil of geranium, ½ drm.; oil of orange, 10 min. Mix.

Cologne Solid Perfume.—Essence of bergamot, 1 oz.; essence of lemon, 1 oz.; oil of citronella, ½ oz.; oil of neroli, ½ oz.; oil of rosemary, 80 min.; oil of geranium, 10 min. Mix.—*Zieliz, in Brit. and Col. Druggist.*

Petroleum, Deodorizing. According to the *Revue Scientifique*, petroleum may be deodorized by shaking it first with 100 grm. of chlorinated lime for every 4·5 liters, adding a little hydrochloric acid, then transferring the liquid to a vessel containing lime, and again shaking until all the chlorine is removed. After standing, the petroleum is decanted.—*Druggists' Circular.*

To mask the unpleasant odor of petroleum, etc., an addition of 1 per cent. of amyl-acetate is recommended. To destroy the nasty smell of benzine, and at the same time render the benzine colorless, Berninger proceeds as follows: To a mixture of ¼ liter of sulphuric acid and 1·75 liters of water add, after cooling, 30 grm. of potassium permanganate; next mix with 4·5 liters of benzine and allow to stand for 24 hours, shaking occasionally. After this period the benzine is lifted off and agitated for several hours with a solution of 7·5 grm. of potassium permanganate and 15 grm. of sodium carbonate in 1 liter of water. The separating benzine is said to be odorless and colorless, without having to be again distilled.—*Wiener Drogisten Zeitung.*

Phosphate Solution.—When acid phosphates are asked for, it is but honest to supply the article known as "Horsford's." When not as specifically asked for, we learn that dilute phosphoric acid is sometimes used; at others a solution of which the following is an example:

Compound Phosphate Solution.- Magnesium carbonate, calcium carbonate, potassium bicarbonate, each 600 grm.; phosphoric acid (U. S. P.), 10 fl. oz.; water, to make 5 pt. Mix and filter.

This solution, when added 1 to 2 fl. drm. to any of the fruit syrups, will make an acceptable phosphatic beverage.

Orange (or other) *Phosphates.*—Into a mineral water (7 or 8 oz.) glass draw 1 to 1½ oz. of the specified fruit syrup, add 1 drm. dilute phosphoric acid or phosphate solution; in another glass draw plain carbonic acid water and pour into the first tumbler or glass to fill it, avoiding foam. This is preferable to making a long line of varying fruit phosphate syrups.—*Pharmaceutical Record.*

Photography.—In addition to the many formulas given in the body of the book, the ones in the present appendix will be found to include the latest developments in the art.

Albumen Prints, to Renew and Clean Old.—To renew and clean old albumen prints, a solution of bichloride of mercury more or less acidulated is used, which gives to the prints a fine purple color. M. Gabelle, in a communication to the Société Française de Photographie, has given the following formula:

Water	85 c.c.
Bichloride of mercury, saturated solution	10 c.c.
Hydrochloric acid	5 c.c.

These proportions, however, are not absolute. The hydrochloric acid is useful for sulphated prints upon collodion papers. The action of the bath is immediate, almost instantaneous, in fact, for certain papers, such as citrate of silver. It is slower for those papers whose surface layer is hard. As soon as the result is obtained, the print should be washed in several changes of water for an hour at least. All contact with hypo should be avoided, as this gives yellow stains which cannot be removed. The tones thus obtained vary from reddish to violet.

In the case of fresh prints, good purple tones may be obtained by this process, but they should have been previously toned in a solution which contains a certain proportion of old bath. M. Gabelle gives the following formulas for use in this case:

Old used bath		750 grm.
New bath	Alum 30 grm. Hypo 300 grm. Acetate lead 1 grm. Water 100 grm.	250 grm.
Chloride of gold solution 1 p. c.		8 c.c.

Allow to stand for two days. Tone the proofs for a long time, say 20 to 30 minutes, and wash for three hours. After allowing to drip, they are immersed in the following bath:

Water	100 c.c.
Bichloride of mercury, saturated solution	5 c.c.

As soon as the desired tone is obtained, which should be in about one minute, remove and wash carefully for an hour and dry. This should be done by diffused light. Great cleanliness is recommended in this operation, and hypo stains are to be avoided.

Black Prints.—1 A black process is given in the *Photocopie* of A. Fisch. The process is tech-

nically known as heliography, is simple and inexpensive, while the prints are ink-black, and are made from drawings or positives and negatives. We owe this process to Poitevin, but it has been slightly improved.

Sensitizing Solution.—Dissolve separately: (1.) Gum arabic, 13 drm.; water, 17 oz. (2.) Tartaric acid, 13 drm.; water, 6 oz. 6 drm. (3.) Persulphite of iron, 8 drm.; water, 6 oz. 6 drm.

The third solution is poured into the second, well agitated, and then these two solutions united are added to the first, continually stirring. When the mixture is complete, add slowly, still stirring, 100 c. c. (3 fl. oz. 3 drm.) of liquid acid perchloride of iron at 45° B. Filter into a bottle, and keep away from the light. It keeps well for a very long time.

Select a paper that is very strong, well sized, and as little porous as possible. By means of a large brush or sponge apply the sensitizing liquid very equally in very thin and smooth coats; then dry as rapidly as possible with heat, without exceeding, however, a temperature of 55° C. (131° F.) The paper should dry in a dark place, and be kept away from light and dampness. Notwithstanding all these precautions, it does not keep very long. It should be of a yellow color.

Printing.—The tracing, made with very black ink, is placed in the printing frame, the drawing in direct contact with the glass; then place over it the sensitized paper, the prepared side in contact with the back of the tracing. The progress of insulation is sufficiently seen on the sensitized paper during the exposure. From yellow that it was it should become perfectly white in the clear portions, that is to say, upon which there is no drawing of the transfer or positive cliche that is to be copied; this is ascertained by raising from time to time the shutter of the frame. The exposure lasts 10–12 minutes in the sun; in summer less, in winter more. When the exposure is ended remove the print from the frame, and it should show a yellow drawing upon a white ground. If in the sensitizing bath a few cubic centimeters of a rather highly concentrated solution of sulphocyanide of potassium have been added, the bath becomes blood-red, and colors paper the same. In this case the print also whitens during exposure, but then the image, instead of being yellow, is red on a white ground. This substance, however, is, if we may so speak, inert, or without any other action; it is very fugitive, and even disappears in a short time; it has no other use, therefore, than to render the drawing or the image more visible after exposure.

Developing the Prints.—When the print has been sufficiently exposed, it is taken from the pressure frame and floated for a minute in the following solution, so that the side upon which is the image should alone be in contact with the surface of the liquid, avoiding air bubbles between the two surfaces. The developing bath is composed as follows: Gallic acid (or tannin), 31–46 gr.; oxalic acid, 1¼ gr.; water, 34 oz.

In this bath the orange-yellow or red lines are changed into gallate or tannate of iron, and form, consequently, a veritable black writing ink, as permanent as it. The print is then plunged into ordinary water, well rinsed, dried, and the print is now finished. The violet-black lines become darker in drying, but unfortunately the ground which appears of a pure white often acquires, in drying, a light violet tint. For prints with half tones this is of no importance; but for the reproduction of plans, for example, it is very objectionable.

Blue Prints.—The following formulas from a recent issue of *Photography* produce ferroprussiate paper which is easily and inexpensively worked:

1. Potassium ferricyanide..... 2½ oz.
   Water..... 10 oz.
2. Ammonio-citrate of iron..... 2½ oz.
   Water..... 10 oz.

The two solutions are mixed immediately before use, and should not be exposed to daylight. A suitable paper (hard, smooth surface papers are best) is coated with the mixture by means of a sponge, care being taken to get the coating as even as possible, though a little streakiness is unimportant so long as no portion of the paper is uncovered. The paper is then dried in the dark, and printed under a negative in the ordinary way to bright daylight (sunlight if possible). The shadows should have a bronzed appearance. The print is fixed by washing in water, which may be used hot to facilitate the work. Should the whites refuse to clear, a trace of carbonate of soda will help to brighten them. A few drops of hydrochloric acid in the last washing water brightens the color. This paper requires a strong negative, and is slow in printing.

Quick-Printing Blue Paper.

A.

Tartaric acid ..... 1 oz.
Water ..... 2 oz.

B.

Ferric chloride..... 1 oz.
Water..... 3 oz.

C.

Potassium ferricyanide..... 1 oz.
Water..... 8 oz.

Take 2 drm. of A, and add ammonia drop by drop till the precipitate first formed redissolves. Then add slowly 3 drm. of B, stirring with a glass rod; then add 8 drm. of C, also slowly. If B and C are added quickly, a precipitate will be formed, and the solution spoilt. The paper is coated in the same manner as in the first instance. A little arrowroot paste mixed with the solution will help to keep it on the surface of the paper and will give brighter prints. With this process the three solutions should be combined, and the paper coated and dried (by heat) under 30 minutes, as the solution rapidly decomposes.

Both of these processes give positives from negatives, blue lines on a white ground, and if a drawing is used to print from, white lines on a blue ground.

To obtain positives from positives, or from a drawing, blue on a white background, the formula is modified as follows:

A.

Gum ..... 1 part.
Water..... 5 parts.

B.

Ammonio-citrate of iron ..... 1 part.
Water..... 2 parts.

C.

Ferric chloride..... 1 part.
Water..... 2 parts.

Eight parts of B are added to 30 parts of A, and then 5 parts of C are stirred in, and the mixture is applied to the paper as before. This solution also rapidly spoils. After exposure, the prints are developed with—

Potassium ferricyanide..... 50 grn.
Water..... 1 oz.

Applied with a brush. So soon as the detail appears, the print is rapidly rinsed in water, and transferred to a bath of—

Hydrochloric acid..... 1 oz.
Water..... 10 oz.

To clear the whites.

Bromide Paper for Amateur's Use.—It is generally believed that the preparation of bromide paper involves great difficulties, and in consequence is practically impossible for the amateur. However, these difficulties are not insurmountable, and with careful and clean operation successful results may be obtained. Besides, the paper thus prepared presents cer-

tain advantages over the paper of commerce, for by modifying the composition of the emulsion, the final tone may be varied, and shades from red to sepia and black may be obtained without varying the development. As the same emulsion may be used to give these different tones, one may prepare as much of each color as is necessary. When, for instance, the required amount of paper of black tone has been prepared, the same emulsion may be utilized to obtain other shades by the simple addition of certain chemicals. Mr. Thorne Baker gives the following process, which he has used with success: 2 grm. of Nelson's gelatine No. 1 are swelled in 28 c. c. water; it is more convenient to do this in a graduated measure placed in a cylindrical vessel of larger dimensions. When the gelatine has absorbed all the water, it is melted by slightly heating the water in the outer vessel, which is filled to three-quarters the height of the graduate. When the gelatine is melted, 1·2 grm. bromide of ammonium are added, and the mixture introduced into a flask previously rinsed with distilled water, then a solution of 1·7 grm. in 28 c. c. water is added, this latter operation being carried out in the dark-room. The mixture should be well agitated. The emulsion is then heated to 65° C. for ten minutes, then filtered through four layers of fine muslin; it is thus filtered three or four times and then cooled. When completely cool, the emulsion is cut into small pieces and placed upon canvas, the four corners of which are then brought together and the emulsion forced through the canvas. After this operation it should be carefully washed with distilled water, preferably in a funnel suitably arranged for the purpose. The emulsion is then remelted in a porcelain dish placed in a larger vessel containing hot water. To sensitize the paper, it is floated for three minutes upon the emulsion, drained, and dried flat upon blotting paper. The paper thus prepared gives black tones. To obtain brown tones, only 1 grm. of bromide of ammonium is taken, to which is added 0·2 grm. iodide of potassium. The sensitiveness of the paper varies according to the quantity of haloid salts present. For development a dilute bath of hydroquinone, alone or in combination with metol, may be used.

Bromide Prints, Coloring.—A number of processes have already been given for the coloring of bromide prints. M. Henry has obtained very good results with the use of oil or water colors as well as for pastel in the following manner:

For oil colors, a hot solution of 3 per cent. of good white gelatine is spread upon the surface of the print by means of a wide and fine sable brush. After drying, the layer thus formed will take oil colors readily, and one may proceed to color the print as desired. For water colors, the best results are obtained by the use of a solution of 120 grm. shellac in 240 c. c. alcohol. When completely dissolved, the solution is allowed to stand for 24 hours, and is diluted by taking 120 c. c. of the former and 120 c. c. alcohol. This is to be filtered before using. The solution is applied to the surface of the bromide print by means of an atomizer until it appears to be slightly wet. When the print is well dried, which takes from 10 to 15 minutes, water colors may be applied as desired. If in certain parts the print does not take the color sufficiently, the process of applying the solution is repeated in these places. The fixative varnish used for charcoal drawings, etc., may be used instead of the solution of shellac. The use of pastel is especially in favor for retouching or coloring bromide prints, but it is necessary that the paper should have sufficient grain in order that the pastel may be readily applied. M. Henry has found that this grain may be obtained by the use of powdered pumice stone in the following manner: A tuft of cotton is thoroughly impregnated with the powder, and, after having applied to the surface of the print a layer of the shellac solution above mentioned, the powder is applied by tapping lightly with the wad of cotton. The print should thus be covered with the powder before the solution is dry; in this way the powder attaches itself, and is fixed during the drying of the solution, leaving below a clear image. If necessary, the operation may be repeated until the desired grain is produced.

Citrate Paper.—A Gelatino-Citrate of Silver Emulsion for Photographic Paper.—At a recent session of the Union Nationale des Sociétés Photographiques de France, M. A. Blanc brings out the fact that the formulas for preparing the photographic papers of the citrate of silver type are little known, and he proposes to give a formula which he has found very good in practice, giving very clear whites with a great facility in toning. Before proceeding to prepare the emulsion proper, a preservative emulsion is first prepared according to the formula:

Alcohol, 90° ..... 15 c. c., 4 drm.
White shellac ..... 5 grm., 1¼ drm.

Dissolve hot and pour rapidly into 100 c. c. or 3 oz. of boiling water; filter through absorbent cotton. The yellowish-white emulsion thus formed will keep for a considerable time. To prepare the sensitive emulsion, he proceeds as follows:

Solution A.

Gelatine, best quality .. 9 grm., 2 drm. 15 grn.
Chloride of cobalt, 5 per cent. solution. .... 6 c. c., 1½ drm.
Neutral tartrate of ammonia ..... 2 grm., 30 grn.
Citrate of ammonia .... ½ grm., 8 grn.
Water ..... 70 c. c., 2 oz. 1½ drm.

This is to be placed in a porcelain receptacle of about 150 c. c. or 5 oz. capacity; in a smaller vessel is placed—

Solution B.

Nitric acid ..... 2·3 grm., 33 grn.
Distilled water ..... 20 c. c., 5 drm.

After mixing, add 2½ grm. or 38 grn. crystallized nitrate of silver.

The vessels A and B are placed in a water-bath and the temperature kept between 70° and 80° C. Each solution having been well mixed, B is poured rapidly into A, and to the emulsion which forms is added:

Alcohol, 90° .... 10 c. c., 2½ drm.
Preservative emulsion. 5 c. c., 1¼ drm.

Mix and filter through absorbent cotton; the emulsion is then ready to be applied to the paper. It should be used as soon as possible after preparation, as it will not keep longer than a few days. The paper, of course, may be kept for a long time without deterioration.

Colored Photographic Prints, Formulas for Making Different.—Mr. A. Lizzard in *Anthony's Bulletin* gives a translation from a French work on the different processes for producing prints in various colors.

"Process with nitrates of uranium and copper." By means of this process, which is as rapid as that of the salts of silver, prints of a brown tone are obtained very warm, very agreeable and of an artistic stamp.

The sensitizing bath is composed of: A. Uranium nitrate, 23 grm.; distilled water, 80 c. c. B. Copper nitrate, 7 grm.; distilled water, 80 c. c.

Mix these two solutions in a tray and immerse in it the gelatine sized paper, for about two minutes; then dry it in the dark. The paper thus prepared will keep for a considerable length of time, and it becomes also very leathery. The exposure to the sun requires not longer than ten minutes, a weak image showing in the printing frame. It is then developed by immersing in a solution of: Yellow prussiate of potash, 16 grm.; distilled water, 700 c. c.

The image will instantly appear with a rich

red-brown tone, with metallic reflection and bronzed. When the immersion has been sufficient, the image will appear with a nearly equal intensity on both sides, because it is in the body of the paper. By this means very fine transparent pictures are easily obtained. As soon as the print reaches the desired tone wash it in pure water until the whites have become clear and pure, and all soluble salts eliminated; then hang it up to dry. No other fixing will be necessary.

In place of the yellow prussiate bath, if one is used, composed of 2 parts chloride of platinum to 100 parts water, the prints will be a beautiful black.

In the same book is given a "process with nitrate of silver and uranium" which promises very fine results. Float a sheet of paper on a sensitizing bath composed of the following: A. Uranium nitrate, 60 grm.; distilled water, 50 c. c. B. Silver nitrate, 8 grm.; distilled water, 50 c. c.

Mix the two solutions, float the paper for two or three minutes, and hang it up to dry in a dark room. Expose it under the negative and immerse into a bath composed of: Protosulphate of iron, 16 grm.; tartaric acid, 8 grm.; sulphuric acid, a few drops; distilled water, 200 c. c.

The development is very rapid, and the print is fixed by washing in pure or rain water. The sensitiveness of this paper is so great that in diffused light a print is visible and black in eighteen seconds, and in half an hour before a kerosene light of moderate size at five inches distant from the flame. The process is very simple, and the chemicals of the ordinary kind to be found in every well conducted dark room.

Copying.—Daguerreotypes.—First remove the plate carefully from the mount, and pass a camel's hair brush over the surface and clean it most carefully. After it is cleaned it may be copied in the following manner: It must be placed in a good light. If a top light, the plate must be placed sideways, so that the vertical light may fall in the direction of what are called the buff marks across the plate. If a side light, then of course the plate must be fixed upright. Placed in the sun at a proper angle gives the best of all illumination, if convenient to do so. The picture having been arranged, place the camera as for copying a photograph, using a rapid rectilinear lens and medium stop, and to avoid reflections in front, a piece of cardboard about a foot square, covered with black velvet, having an opening just showing the glass of the lens. This will very effectually prevent all reflection on the polished surface. Use a slow landscape plate not a rapid one, for in all cases the slower the better are the results obtained. Great care should be taken in remounting the daguerreotype; it must be bound round with gummed paper to prevent air getting in between the plate and the glass. If it does, it will soon show signs of tarnishing. When well done, a new lease of existence will be secured.

Negatives.—This may be done either by contact or by aid of the camera. Or course the resultant picture is a positive. With the camera, an enlarging camera can be used or an ordinary one. With the latter the best way is to block out a window, leaving space enough only to insert the negative, placing a piece of fine and uniformly ground glass about 1 in. from it on the outside.

Silver Prints.—Place the photograph to be copied in an upright position by pinning to a drawing board, and stand this on a table. If you do not wish to use pins, an ordinary printing frame with a glass bed answers very well, care being taken that there are no scratches, etc., on the glass. Contrary to theory of the necessity of a front light, use an oblique side light, and the resultant negatives are practically free from grain. The camera should focus from the back, in order to obtain an accurate focus. The lens needed is a rapid rectilinear, of sufficient size to cover well the size of the plate to be used, and use slow plates. If rapid plates are used, it is essential that the emulsion should be rich in silver and plenty of it on the plate.

Oil Paintings.—Require more care, and they always should be lighted from the same side as in the picture—not the reverse. The very best effects are obtained by using orthochromatic plates of medium rapidity. The yellow screen must also be used with ordinary plates to obtain any results that will prove satisfactory. But if possible, use the orthochromatic. In regard to the length of time required for the exposure, experience must alone determine this, for the exposure must vary very much, the colors of the subject, the actinic power of the light, and the rapidity of the plate being the factors that decide the question. Anyhow, give enough.

By Gas Light, Oil, Magnesium.—Copying can also be done by the aid of gas light, oil lamps and magnesium, the latter being very effective. In all cases, except when made by contact, attention should be had to the proper adjustments of reflectors and screens. Counterfeit and raised checks, etc., have been detected by copying and enlarging the same, showing very plainly the original figures and names under the false.

Dark Room.—The room—too often a closet—in which all the operations requiring the actual handling of the sensitive plate must be conducted. It should be of sufficient size to enable the operator to move about in comfortably, and to give orderly place for all the various articles necessary in the different manipulations that may be required in sensitizing and development, or whenever any work is to be done requiring a non-actinic light. A room smaller than 8x10 I believe to be objectionable in very many if not in all respects, both to the operator and the operations therein conducted. It cannot be kept in a state of cleanliness, which is absolutely indispensable for first-class work. It cannot be properly ventilated, and at an equable temperature at all times, to say nothing of the bottles and the various other articles necessary in the proper development and care of the plates. The dark room should always be kept warm, never, if possible, below 60 degrees F., and this, in cold weather, can always be done by one of the many coal oil stoves made expressly for heating purposes. The opening to the dark room should be through two doors nearly opposite each other, and opening differently, with a partial partition between them, thus cutting off all chance of light entering the room while at work, and yet allowing a thorough cleaning of the room when necessary. Have the shelves arranged around the room and of a sufficient number to enable one to have a place for everything, and thereby everything in its place. The top shelves for stock solutions, and a careful watch kept on them that there is enough and to spare at all times. The middle shelves to be occupied with convenient size bottles of various dilute solutions for every day use, and are to be kept filled from the stock solutions on the upper shelves, but keep the different solutions separate. It is convenient to have the lower shelf at least three feet from the floor and somewhat broader than the other shelves. A small shelf or rack, about the level of the eye, on either side of the sink, should hold the graduate measures and stirring rods. Upon the table itself should be arranged only the dishes, trays, etc., in actual use at the time. Trays, large and small, to be kept in racks beneath the table, according to their uses, and should be properly labeled. The sink should be at right angles to the table, at least 36x22 inches, and supplied with a good drain pipe. If possible, it should be of iron, porcelain lined, but a good one can be made

of sufficiently thick wood lined with heavy sheet copper or zinc. The plugs to the drain pipe should fit tightly. On either side of the sink, a shelf slightly inclined should be fastened, to hold trays, etc., and let the shelf on the further side from the table be always devoted to the clearing (fixing) bath, and for no other purpose, thus keeping the danger of contamination by hypo. at the minimum. Under the sinks racks are to be placed to dry trays, etc. If there be no regular supply of water by the ordinary pipe, a small keg will have to be placed a sufficient height, but not too high, to give a good force to the flow of water, which may be directed to any spot desired by attaching a rubber tube to the spigot in the keg, and the flow regulated by a spring clip.

For Illumination—Daylight, gas, lamp, electrical (incandescent) light can be used, provided it is properly protected by a shade or covering of some non-actinic material (glass, medium, or paper). The day of the ruby has in a great measure passed, since it has been found that a safe and decidedly more pleasant light can be obtained with other equally if not better non-actinic colors. Some combine with the ruby, canary or sunflower tint, others green, etc. But it will be wise to test the screens from time to time as to their safety. The dark room should be dark only to the actinic blue and violet rays of light, but illuminated enough by the non-actinic yellow and red rays to be enabled to see everything that is to be seen without strain to the eyes, and, in fact, pleasant to the operator. Should the room have one or more windows, block out all but one or two panes with some black material of sufficient thickness to exclude all light. The uncovered pane can be covered by three or more thicknesses of tissue paper of sunflower tint, held in its place with an additional pane of glass fastened to the frame. This will be found to give a safe enough light, and plenty of it, if it is desirable to work by daylight.

Ventilation.—It is extremely important that the dark room should be thoroughly ventilated at all times; and to assist in this, many are in the habit of using the heat generated by the lantern, extending the chimney of the same in the shape of a long pipe, and thus creating a current of air out of the dark room.

Developers.—Developers are arranged in the order of their names.

Accelerator, the "Excelsior."—This accelerator is of German origin. It can be employed both with ferrous oxalate or pyrogallol. Zinc filings, 100 parts; water, 500 parts; sulphuric acid, 50 parts.

Shake well and set aside for a few days. The vial should be well corked. Add then 250 parts of sodium sulphite, set aside again for a few days, and dilute with an equal volume of: Ammonium sulphite, 250 parts; water, 500 parts. *This is the stock solution.* If to be used with pyrogallol, one should add 1 part of ammonium sulphocyanate to 50 parts of it, or 4 parts of ammonio-citrate of iron if employed with ferrous oxalate. These solutions keep for a long time in well corked bottles. For pyrogallol 2½ per 100 are added to the developing solution and for ferrous oxalate 5 per 100. A greater percentage produces yellow fog.

In the chemical action, which takes place in the preparation of the accelerator, sodium hyposulphite (formerly hydrosulphite) is formed, and to it is due the accelerating property.

The process is not new; it is similar to that published in 1877 by Mr. L. O. Sammann, for the development of the luminous image on collodion emulsion films.

Acetone Pyro-Developer.—Acetone has been substituted as an alkali by Messrs. Lumière Bros. The following is a normal developer:

Water	100 parts.
Sodium sulphite (anhydrous)	5 parts.
Acetone solution	10 parts.
Pyrogallic acid	1 part.

Adurol Developer.—Is allied to hydroquinone, but more energetic, especially in combination with potassium carbonate.

No. 1.

Water	10 oz.
Sodium sulphite crystals, c. p.	2 oz.
Adurol	85 grn.

No. 2.

Water	10 oz.
Potassium carbonate	1½ oz.

For normal exposures use equal parts.

Begin development with half the required amount of No. 2, increasing the quantity as development proceeds. Use bromide of potassium in case of over-exposure.

Amidol Developer.—Requires no alkali and is very simple, giving perfectly clear shadows in negatives and remarkably pure high lights in transparencies and slides.

A developer for slides is prepared by dissolving—

Sodium sulphite crystals, chemically pure	5 oz.
In water (distilled or boiled)	26 oz.

And storing this solution in small, tightly corked bottles of one or two ounces each. Such method preserves the sulphite solution to better advantage.

To form the developer pour a two ounce bottle of sodium sulphite into the graduate; add one and a half ounces of water, and finally four grains of dry amidol, which will quickly dissolve. This is then poured over the plate, and development will proceed rapidly. The speed of development may be varied by the addition of water or amidol; it may be restrained by the addition of a few drops of a 1 to 10 solution of bromide of potassium, or accelerated when necessary by adding a few drops of a carbonate of potassium solution.

Automatic Development of Photographic Plates.—A method of automatic development has been devised by which each plate is coated on the back with the necessary products, and the development is carried out in water which has been made slightly alkaline; this may be of advantage to tourists, as it avoids the carrying of chemicals. The formula for the solution is as follows:

Pyrogallic acid	10 grm., 2½ drm.
Salicylic acid	1 grm., 15 grn.
Dextrine	10 grm., 2½ drm.
Alcohol	4 c. c., 1 drm.
Water	20. c. c., 5 drm.

The solution is spread upon the back of the plate and allowed to dry. The exposure is made as usual, and, to develop, it is sufficient to put the plate in water to which a few drops of ammonia, or of a solution of carbonate of potash, prepared by dissolving 1 oz. of potash in 3 oz. of water, have been added. The coating dissolves, and the developer is thus prepared.

Diogen.—Useful in the development of greatly overtimed or undertimed plates, and is prepared in one solution which may be modified by the addition of water or bromide of potassium. The concentrated solution is prepared as follows:

Water	9 oz.
Sodium sulphite (crystals)	3½ oz.
Diogen	7 drm.
Potassium carbonate	4½ oz.

The solution should be filtered and preserved in a well stoppered bottle, and will keep for a long time.

Developer for normally exposed plates is prepared as follows:

Concentrated diogen solution	4 drm.
Water	2 oz. 1 drm.
Potassium bromide solution (1 to 10)	2 drops.

When the nature of the exposure of the plate

is unknown, prepare the following testing solution;

Concen't'd diogen sol....	1 drm. 25 min.
Water	3½ oz.
Potassium bromide solution (1 to 10)	2 drops.

The temperature should be 68° F. If the high lights appear in four minutes, the plate is correctly exposed, and can be put into normal developer. If high lights appear before four minutes, the plate is over-exposed. Under-exposure is compensated for by the addition of water and slow development. Over-exposure is remedied by putting plates into a solution containing 2 oz. of water, 4 drm. of the concentrated diogen solution and from 2 drops to 85 min. of a (1 to 10) potassium bromide solution.

Diphenal Developer.—A special preparation which is chemically di-amido-oxydiphenyl introduced by the Actien-Gesellschaft für Anilin Fabrikation, of Berlin. It has a brown color.

For correctly exposed plates:

Diphenal.....	1 part.
Water	15-20 parts.

For over-exposed plates:

Diphenal.....	1 part.
Water	8-10 parts.

For under-exposed plates:

Diphenal	1 part.
Water.....	20-25 parts.

Glycin Developers.—Next to amidol this is claimed to be an excellent developer for line or process work, since it gives a vigorous and soft deposit with remarkable freedom from fog.

No. 1.

Glycin.....	4 grm.,	60 grn.
Sodium sulphite c. p. crystals.....	15 grm.,	½ oz.
Potassium carb. c. p.	4 grm.,	60 grn.
Hot water.	100 c. c.,	3½ oz.

No. 2.

Water (filtered).....	200 c. c., 7 oz.
Potassium carb. c. p..	20 grm., 300 grn.

Normal developer is prepared by adding 1 part of No. 1 to 2 parts of No. 2. Development proceeds in about 2 minutes after the application of the developer. With a 5 oz. solution one dozen 8 by 10 plates may be developed, one after the other in succession.

Imogen.—Adapted for use on extremely rapid plates; does not stain the fingers. Prepared in two solutions.

No. 1.

A	Hot water.....	1000 c.c., 34 oz.
	Sodium sulphite (crystals).....	100 grm., 3 oz. 220 grn.
	Imogen.....	33 grm., 1 oz. 28 grn.
B	Hot water.....	500 c.c., 17½ oz.
	Sodium carbonate crystals.....	250 grm., 8 oz. 10 grn.

Anhydrous sulphite soda may be used instead of crystals, 50 grm. in place of 100 grm.

Carbonate of potash may supplant carbonate of soda, 100 grm. (3 oz. 220 grn.) dissolved in 500 c. cm. or 17½ oz. of water.

For normal exposures, mix—

A.—40 c.c., or 2 parts by measure.
B.—20 c.c., or 1 part by measure.

The image appears in 30 or 45 seconds, development completed in 4 or 5 minutes.

For under-exposure, water is added.

For over-exposure, add few drops of (1 oz. to 10 oz.) solution of bromide of potassium.

Acid fixing bath is preferred; 5 parts by weight sodium sulphite crystals; 100 parts by weight water acidulated with 1 part by weight of sulphuric acid; then add 20 parts by weight hyposulphite of soda.

Kachin Developer.—This developer is similar in character to pyrocatechin.

A.

Water.....	250 c. c., 8 oz.
Sodium sulphite	25 grm., 6 drm. 15 grn.
Kachin	5 grm., 1¼ drm.

B.

Water	250 c. c., 8 oz.
Caustic soda (pure sticks)	5 grm., 75 grn.
Phosphate of soda . ..	47 grm., 1½ oz.

For use 1 part of A is mixed with 1 part of B and 1 part of water.

In a later grade of kachin, carbonate of soda is substituted for caustic soda.

Combined Kachin Developer and Fixing Bath.—In the *Photogram* Mr. W. Ethelbert Henry gives the following formula for a single combined developing and fixing solution:

A.—Sodium sulphite crystals.....	30 grm.,	or 3 oz. 6 drm.
Distilled water.. ..	75 c. c.,	or 9 oz. 3 drm.
Caustic soda, pure..	7 grm.,	or 7 drm.
Kachin.....	7 grm.,	or 7 drm.
B.—Hypo	20 grm.,	or 2 oz.
Water.....	100 c. c.,	or 10 oz.

For use, take 12 parts of A, 20 parts of B, and 30 parts of water. The mixed solutions form a combined developer and fixing bath which works with great rapidity, fixation and development taking place at the same time. It is well to bear in mind, however, that plates must be fully exposed for this treatment, which is quite unsuitable for under-exposures. A few trials will also be necessary in order to determine the most suitable quantity of hypo solution for the particular brand of plates in use, some requiring more than others to give the best results. The negatives produced by this means are quite brilliant and free from any indication of fog.

Metacarbol Developer. Is a single solution, rapid, energetic developer, free from producing fog or veiling, and gives soft effects. Plate must be kept in developer till the details appear to be buried, as the hypo reduces density a little.

Hot water.....	20 oz.
Metacarbol.....	50 grn.
Sodium sulphite crystals c. p...	200 grn.
Caustic soda.....	100 grn.

The ingredients are dissolved in the successive order named; the solution is filtered. Two parts of water may be added to 1 part of the above, for a normal developer; will develop several plates.

Metol Developer.—Recommended for development of short or instantaneous exposures.

No. 1.

Water.....	32 oz.
Metol.....	½ oz.

First dissolve the metol in 16 oz. of water, then in the second 16 oz. dissolve—

Sodium sulphite crystals.....	5 oz.

And add the two, which forms a stock solution.

No. 2.

Water	32 oz.
Potassium carbonate...	2½ oz.

No. 3.

Bromide of potassium solution, 20 grn.; dissolved in 32 oz. of water.

For normal exposure, take 2 oz. of No. 1, ½ oz. of No. 2, and add 3 oz. of water. If development proceeds too rapidly, add ½ drm. of No. 3 solution. For under-exposure, increase the amount of No. 2.

Metol and Pyro Developer.—

A.—Pyro	45 grm.,	1½ oz.
Metol.....	35 grm.,	1 oz. 45 grn.
Potass. meta bisulphite.....	100 grm.,	3 oz. 60 grn.
Potass. bromide....	15 grm.,	225 grn.
Water, to make....	312 c. c.,	16 oz.

B.—Sodium carbonate crystals. ..... 3¼ oz.
Sodium sulphite crystals. ..... ½ oz.
Water, to make....312 c. c., 16 oz.

For use, mix equal parts A and B. The developer is very quick and gives splendid density, but must be thrown out after use, as it oxidizes very rapidly. For time exposures the pyro and soda is the best, thus:

A.—Pyro ..... .140 grm., 4 oz. 3 drm.
Potass. meta bisulphite .. .. 15 grm., 225 grn.
Potass. bromide.... 17 grm., 4 drm. 15 grn.
Water, to make....640 c. c., 20 oz.

B.—Sodium sulphite crystals..... 2 oz., 20 grm.
Sodium carbonate crystals. .. .. 2 oz., 20 grm.
Water, to make..... 20 oz., 640 c. c.

Use equal parts A and B.

Metol-Quinol Developer.—
Metol. ..... 10 grm., 150 grn.
Hydroquinone. .. 90 grm., 2 oz. 8½ drm.
Sodium sulphite ..300 grm., 9 oz. 3 drm.
Sodium carbonate.600 grm., 18 oz. 6 drm.
Water, to make 640 c. c., 20 oz.
Use equal parts of developer and water.

Ortol Metol Developer.—A formula suggested by Henry Wenzel, Jr., said to be a stainless, energetic developer, producing a deposit resembling pyro color, and can be used repeatedly:

Water.....	10 oz.
Metol (Hauff).....	12 grn.
Meta bisulphite of potassium.....	6 grn.
Ortol.....	18 grn.
Sodium sulphite (crystals)..	½ oz.
Potassium carbonate.....	80 grn.
Bromide of potassium.....	5 to 10 grn.
Sodium hyposulphite.....	1 grn.

Ortol Developer.—Produces a brownish-black deposit, resembling that obtained with pyro. Is a rapid developer, builds up density simultaneously with the appearance of detail, and will keep clear for a long period in a well stoppered bottle. Several plates may be developed with one solution.

No. 1.

Water	10 oz.
Meta bisulphite of potassium....	40 grn.
Ortol.....	80 grn.

No. 2.

Water....	10 oz.
Sodium sulphite (crystals)... . .	1 oz.
Potassium carbonate c. p.....	160 grn.
Sodium carbonate.....	320 grn.

For normal exposures mix equal parts of Nos. 1 and 2 and an equal bulk of water. If the exposure is unknown or uncertain, begin with 1 part of No. 1 and ⅛ part of No. 2 and enough water to equal part of No. 1. As development proceeds, add small quantities of No. 2 till the image is fully brought out. Development can be effected without the use of sodium carbonate as an alkali.

Plates, Under-exposed, Developer for.—A developer which has been used with success for under-exposed plates is given in the following formula:

Water .....1,000 c. c.,		34 oz.
Metol....	4 grm.,	60 grn.
Hydroquinone...	2 grm.,	30 grn.
Sulphite of soda..	60 grm.,	1 oz. 7 drm.
Carbonate of soda	60 grm.,	1 oz. 7 drm.

This solution is to be recommended, as it will keep for a long time and does not stain the plate. A larger amount of carbonate of soda may be added, kept in a separate solution, in case development proceeds too slowly.

Platinotype Paper, Developer for.—

Water	1,000 parts.
Oxalate of potash	300 parts.
Alum	25 parts.
Tartaric acid.....	3 parts.

For use it may be diluted over half with water.

Pyrocatechin-Phosphate Developer.—

Solution No. 1.

Water..... 16	oz.
Sodium sulphite (cryst.) 1½	oz., 52 grn.
Pyrocatechin	154 grn.

No. 2.

Water.....	16 oz.
Sodium phosphate (crys.)... ...	3 oz.
Caustic soda (purified in sticks)....	154 grn.

One part of No. 1 is mixed with 1 part of No. 2 and from 1 to 3 parts of water. A few drops of a 1 to 10 solution of bromide of potassium may be added if the exposure is full.

Pyro-Metol Developer Recommended for Lovell Plates.—

No. 1.

Water..... 16	oz.
Oxalic acid.....	¼ oz.
Pyrogallic acid..... 1	oz.
Metol (Hauff)	¼ oz.
Bromide of potassium.....16	grn.

No. 2.

Water..... 64	oz.
Sodium sulphite crystals..... 8	oz.
Sodium carbonate 4	oz.

For use, take of No. 1.....	1 oz.
No. 2.....	5 oz.
Water.....	2 to 4 oz.

The Para-Amidophenol Developer.—We first mixed up a developer, according to the formula advised by Lumiere, of Paris, in the following proportions:

Water...	7¾ oz.
Sodium sulphite..... ...	¾ oz.
Carbonate of potash.....	160 grn.
Para-amidophenol.	15 grn.

The water was about 65° F.; it required a long time to dissolve the salt, which appeared to be the only drawback.

We tried printing a transparency on a moderately rapid plate in contact from a negative, first giving a fraction of a second's exposure to weak day light; second, by five seconds' exposure, three feet away from a flat gas light; third, by a second's exposure, four feet away from the same light; and fourth, by a second's exposure, six feet away.

In the first and second trials the moment the plate touched the developer it darkened over at once completely, the whole of the image being covered with fog. In the third case a fairly good overexposed positive was obtained, while the fourth was a trifle undertimed and weak, though remarkably clear in the high lights. The same effect was observed in the development of bromide paper. A fifth and later experiment with another solution, containing no alkali, on a slow Eastman plate, produced a much better positive.

The conclusion arrived at was that the developer contained too much alkali for time exposures, but might be adapted for those that are instantaneous. At another time we tried dissolving 10 grn. of the Para salt in 5 oz. of water, at a temperature of 60° F. After several minutes of rapid stirring with a glass rod only about one-quarter seemed to disappear. We then heated the solution in a water bath until it reached 100° F., and after stirring for five minutes were successful in dissolving it. The solution was now filtered and was as clear and limpid as water, having a very slight purplish brown cast by reflected light.

Having been successful in developing plates with simple eikonogen, without the addition of carbonate potash as an alkali, we tried the experiment of exposing behind the same negative a slow Eastman transparency plate three feet away from a gas burner for five seconds. We poured over it a solution made as follows:

Water	5 oz.
Sodium sulphite	½ oz.
Para-amidophenol	10 grn.

In about fifteen seconds the image began to appear, and in one and one-half minute development was complete. On examining the transparency by daylight, we found that it could have gained a little more needed density by remaining a few minutes longer in the developer. We recommend the above formula for slide making. It yields clear glass, where needed, in the high lights of slides; also gives a pleasing purplish tone, and is suitable for over-exposed plates.

To further test its developing qualities we made two exposures on two of Cramer's 40 plates (4x5) in the camera on a rainy day with a small stop f-128, one of a second, and another of half a second.

On this the above developer, without alkali, acted quite slowly, it being very nearly three minutes before the sky portion began to make its appearance. We accordingly commenced adding in small quantities a solution of carbonate of potash, as small as we thought was sufficient to accelerate the developing action, and obtained two negatives of good quality, having ample density in the sky, with an abundance of detail in the darker portions, and shadows of remarkable clearness. It took about ten minutes for each plate. The solution thus compounded for rapid exposures stood when we finished about as follows:

Warm water	1 oz.
Sodium sulphite (cryst.)	48 grn.
Para-amidophenol	2 grn.
Carbonate of potash	6 grn.

For extreme short exposures the potash may be increased up to 20 or 24 grn. to the ounce.

For developing slow plates for time work, Dr. Charles Ehrmann recommends the following:

Distilled hot water, 150° F.	10 oz.
Sodium sulphite (cryst.)	1½ oz.
Para-amidophenol	48 grn.
Carbonate of potash	½ oz.

If kept at 65° F., none of the para will crystallize out. It will be noticed that high temperature makes a solution more than twice as powerful in the para salt than the one at which it was 100° F. The developer can be made to produce opaque blacks in the negative, and leave the shadows crisp and clear and free from fog of any kind. Ten oz. will develop nearly two dozen 6½ x 8½ plates; any slowing up of the developer can be compensated for by the addition of the potash solutions. It retains its clearness perfectly, even if exposed for some time in an open graduate, and after use in development changes to a light lemon yellow color.

Another merit is that it does not stain the fingers, and is therefore the par excellence of development for ladies and others. It is a quick acting developer, becomes less easily exhausted than any other, and will not chemically stain the film. It is remarkable, even by long development, how perfectly clean and white the unexposed portions of the negatives keep. It is advisable to filter the developer occasionally. We commend the developer to all amateurs wishing to obtain, easily, good results, and regard it as an advance in the right direction.—*F. C. Beach in American Amateur Photographer.*

Self-Preserving Ferrous Oxalate Developer.—The following formula is recommended by Dr. Georg Haubenisser, of Germany:

A.—Neutral potassium oxalate	500 grm.
Hot water (preferably distilled)	1,500 c. c.
B.—Ferrous sulphate	200 grm.
Water (boiled or distilled)	600 c. c.
Sulphuric acid	a few drops.
C.—Rochelle salt	20 grm.
Water	100 c. c.
D.—Potassium bromide	10 grm.
Water	100 c. c.

For use, 5 parts of B are mixed with 1 to 1½ parts of C. The mixture is boiled and poured hot into 17½ parts of A, turning the solution reddish brown. To each 100 c. c. of this developer from 5 to 10 drops of D should be added as required. Mixed in this way the developer remains clear, and keeps its reducing power for a long time if the bottle containing it is well stoppered.

For dipping bath development the author gives the following formula:

Potassium oxalate (1:3 solution)	25	parts
Ferrous sulphate (1:3 solution)	5	parts.
Rochelle salt solution	1 to 1½	parts.
Water	100 to 200	parts.
Potassium bromide	as required.	

Tolidol Developer.—A special preparation supposed to contain hydroquinone, metol and other ingredients put up in powdered form by a Chicago house, forming a one-solution developer.

Water	32 oz.
Tolidol	48 grn.
Sodium sulphite, crystals, c. p.	288 grn.
Sodium carbonate	1 oz.

For slow development the solution should be diluted five or six times with water.

Faded Photographs. Put the card in warm water until the paper print may be removed from the card backing without injury. The prints can be restored by means of the following solutions: *a.* Sodium tungstate, 100 parts; water, 5,000 parts. *b.* Precipitated chalk, 4 parts; bleaching powder (chloride of lime), 1 part; sodium aurochloride, 4 parts; distilled water, 400 parts. Solution *b* is made in a well corked yellow glass bottle, is allowed to stand twenty-four hours, and is then filtered into another yellow bottle. The faded prints are well washed, and placed in a mixture 1 to 2 parts of *b* and 40 parts of *a*. When the intensification is sufficient the prints are immersed in a solution of 1 part of hypo in 10 parts of solution *a* until all yellowness has disappeared, and are then well washed.

Halation, to Prevent.—Plate backing to prevent halation may be prepared from:

Paraffine wax	20 parts.
Olive oil	20 parts.
Light lampblack	10 parts.

Let these melt in gentle heat and apply with flat brush. Before development remove with a knife.

In case of emergency a piece of gelatino-chloride paper, printed to redness, and washed free of silver may be used for backing a plate. —*Revue Scientifique.*

Another Method.—Take

Hard soap (in fine shavings)	½ oz.
Alcohol	10 oz.

Digest at a temperature not exceeding 70° F., agitating occasionally, for seven days; filter and dissolve in the filtrate:

Erythrosin	50 grn.
Aurin	50 grn.

This fluid is painted on the back of the plate, and drying in a few minutes, affords efficient protection against halation. It is wiped off with a damp rag before developing. The formula might be improved, it is added, by the

addition of some compatible dye, so that the fluid might be visible in the red light of the dark room.

Intensification.—Ferrous Oxalate Intensifier.

Solution No. 1.

Saturated solution of bichloride of mercury.

Solution No. 2.—Ferrous oxalate.

Prepared by mixing 2 oz. of a saturated solution of ferrous sulphate with 10 oz. of a saturated solution of potassium oxalate made slightly acid by the addition of oxalic acid and further diluted by 6 oz. of water.

The plate is first placed in the No. 1 solution till bleached or whitened, then it is put in water, previously heated, and cooled for a few minutes; then is blackened by the ferrous oxalate solution No. 2. When sufficiently blackened it is washed in two separate baths of cool distilled or boiled water and dried in the usual way. Successive intensification may be given one plate in this way. The deposit obtained is of a very fine character. Hydroquinone, metol, ortol and other developing agents may be used instead in the same way.

Gallic Acid Intensifier.—The image is first bleached in the saturated mercury solution; the plate is then washed and in a tray is submitted to the following freshly prepared solution:

Distilled water	8 oz.
Gallic acid	¼ grn.
Caustic potash c. p.	4 grn.

The blackening occurs quickly while the tray is being rocked, and the plate should be removed without delay to avoid staining.

Lead Intensifier. The following formula suggested by Chapman Jones is said to be effective:

No. 1.

Distilled water	2 oz.
Lead nitrate	20 grn.
Ferricyanide of potassium	60 grn.

After filtering, the negative is placed in this solution and bleached. Prior to the next step the plate must be thoroughly washed until the drainings present a very slight blue color by the addition of a few drops of a 10 per cent. solution of ferrous sulphate. This indicates that the lead is all washed out.

No. 2.

Ammonium sulphide	2 oz.
Water	20 oz.

The plate, on being put in No. 2, at once blackens, giving a deep deposit.

Mercury Iodide Single Solution Intensifier.—Lumiere Brothers have improved this well known intensifier, which avoids the danger of yellowing after the plate is dried, as follows:

Water	50 c. c., 1½ oz.
Sodium sulphite (anhydrous)	5 grm., 1¼ drm.
Mercuric iodide	1 grm., 15 grn.

Dissolve the sulphite soda first, then the iodide of mercury. Plates may be immediately intensified when taken from the fixing bath if they are previously slightly washed. Dried negatives may be put in the bath without previous soaking in water.

The quantity of sodium sulphite may be increased to 10 grm. and the mercuric iodide increased to 2 grm. in case a more rapid solution is desired.

After intensification the negative should be washed, and then immersed for five or ten minutes in any convenient old developer, such as pyro, hydroquinone, metol, ortol, glycin or other developers. This does not change the density, but prevents future yellowing. After immersion in the developer, the plate is next washed and dried.

Sodium Sulphite Intensifier.—This gives a slight intensification to negatives or transparencies. After being well washed the negative is placed in a mercury bleaching solution.

No. 1.—Mercury Solution.

Water	20 oz.
Bichloride of mercury	½ oz.
Bromide of potassium	½ oz.

The negative should be kept in this solution until it is whitened through to the back.

No. 2.—Sulphite Solution.

Water	20 oz.
Sodium sulphite c. p.	2 oz.

The bleached negative is placed in the above until the white portion is converted to a dark chocolate brown color. Should it be slow in doing this, a few drops of citric acid may be added. The process may be repeated if the first operation is not sufficient to give the density desired. The negative should be well washed after the intensification is completed. All the solutions should be filtered.

Line Drawings on Photographs.—*The Pharmaceutical Journal* gives the following process for preparing line drawings on ordinary silver photographs, from which, of course, line "process" plates may then be made where half-tone illustrations are not desired. Any silver print may be used, but the old albumen or bromide papers give the best results. The print need not be deeply printed or toned; all that is necessary is to obtain a distinct image. The lines of any object in the print may now be inked over with a fine drawing pen, using a waterproof black ink. The drawing should be allowed to dry; and then the silver image bleached out by the following bath:

Iodine	10 grm., 2½ drm.
Potass. iodide	40 grm., 1 oz. 2 drm.
Potass. cyanide	40 grm., 1 oz. 2 drm.
Distilled water to make	1,000 c. c., 34 oz.

A short wash after the image has disappeared will leave the line drawing intact.

Mounting Photographic Prints.—To prevent photographic prints from curving when dry, a paste must be used containing as little water as possible. The following formula is recommended:

Gelatine	2 parts.
Water	4 parts.
Alcohol	8 parts.

The alcohol is added slowly as soon as the gelatine is well dissolved in the water, and the vessel turned continually to obtain a homogeneous mixture. The solution must be kept hot during the operation on a water-bath, and should be applied quickly, as it soon dries; the print must be placed exactly the first time, as it adheres at once. The solution keeps for a long time in well-corked bottles.—*The Druggists' Circular and Chemical Gazette.*

Orthochromatic Collodion Emulsion.—Dr. A. Jonas recently published one of the most striking and important papers relating to orthochromatic work which has appeared for many years. For some time a special color-sensitive collodion, manufactured by Dr. E. Albert, of Munich, has held the front rank for the reproduction of colored objects, paintings, etc. Its chief characteristics are extraordinarily high, general and color sensitiveness, and the fact that no yellow screen is necessary for use with the same, the emulsion being so little sensitive comparatively to blue. Dr. Jonas has now published a process which has the same characteristics, and the following is the method of making the emulsion, which might well be undertaken by chemists, and could be supplied to amateurs and professionals, and also to those houses who make a specialty of copying pictures. In Germany it is sold at $3.00 the half liter, or $5.50 per liter, with the special dye solutions, $0.25 per c. c. extra, and the developer at

Lanternists' Ready Reference Table.

(From "Optical Magic Lantern Journal.")

If A = focal length of objective, B = diameter of slide, C = diameter of disc on screen, D = distance between objective and screen, then $D = \frac{C \times A}{B}$ $A = \frac{D \times B}{C}$ $C = \frac{D \times B}{A}$

The following table has been computed by these rules, and will show by a glance the relations between the size of disc and distance from screen for object glasses of all foci from four inches to 15 inches. The diameter of slide is taken as three inches, that being the usual opening of the mat.

Distance between Lantern and Screen.	FOCUS OF LENS																					
	4in.		5in.		6in.		7in.		8in.		9in.		10in.		11in.		12in.		13in.		14in.		15in.	
	DIAMETER OF DISC.																					
	ft	in	ft.	in.	ft	in.	ft.	in.	ft.	in.	ft.	in	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.
10 feet.	7	6	6	0	5	0	4	3	3	9	3	4	3	0	2	9	2	6	2	4	2	2	2	0
11 ,,	8	3	6	7	5	6	4	9	4	2	3	8	3	4	3	0	2	9	2	6	2	4	2	2
12 ,,	9	0	7	2	6	0	5	2	4	6	4	0	3	7	3	3	3	0	2	9	2	7	2	5
13 ,,	9	9	7	10	6	6	5	7	4	11	4	4	3	11	3	7	3	3	3	0	2	9	2	7
14 ,,	10	6	8	5	7	0	6	0	5	3	4	8	4	2	3	10	3	7	3	3	3	0	2	9
15 ,,	11	3	9	0	7	6	6	5	5	8	5	0	4	6	4	1	3	9	3	6	3	3	3	0
20 ,,	15	0	12	0	10	0	8	7	7	6	6	8	6	0	5	6	5	0	4	7	4	3	4	0
25 ,,	18	9	15	0	12	6	10	9	9	4	8	4	7	6	6	10	6	3	5	0	5	4	5	0
30 ,,	22	6	18	0	15	0	12	10	11	3	10	0	9	0	8	2	7	6	6	11	6	5	6	0
35 ,,	26	3	21	0	17	6	15	0	13	1	11	8	10	6	9	6	8	9	8	1	7	6	7	0
40 ,,	30	0	24	0	20	0	17	2	15	0	13	4	12	0	10	10	10	0	9	2	8	6	8	0
45 ,,	33	9	27	0	22	6	19	3	16	10	15	0	13	6	12	3	11	3	10	4	9	8	9	0
50 ,,	37	6	30	0	25	0	21	5	18	9	16	8	15	0	13	8	12	6	11	6	10	9	10	0

EXAMPLES.—An 8in focus lens at a distance of 35ft. will give a disc of 13ft. 1in. To produce a disc of 12ft. with a lens of 10in. focus, the lantern and screen must be separated by 40ft. To produce a disc of 15ft. at a distance of 45ft. will require a lens of 9in. focus.

$0.65 per liter. The raw or plain collodion is made as follows:

Solution 1.—

Ammonium bromide	64 grm.
Distilled water	80 c. c.
Absolute alcohol	800 c. c.
Thick collodion, 4%	1,500 c. c.
Acetic acid	65 c. c.

Dissolve the bromide in the water by the aid of heat; then add the alcohol, collodion, and acetic acid, and shake well.

Solution 2.—

Silver nitrate, crystal	80 grm.
Distilled water	50 c. c.

Dissolve by heat, and add, drop by drop, liquid ammonia 0·91, till the brown precipitate first formed is again redissolved (about 72–75 c. c. are required). Then add 800 c. c. of absolute alcohol, heated to 45° C.

Now, in the dark room, add solution 2 to solution 1 very gradually, shaking between each addition; keep solution 2 at a temperature of 40–50° C. during the mixing, by placing the bottle in hot water. With the above quantity the mixing should take from ten to fifteen minutes. When mixed, a drop of the emulsion is placed on a glass plate, a drop or two of water added, and tested by litmus paper. It should give an acid reaction, and, if alkaline, more acetic acid added to the emulsion, which should be well shaken for fifteen minutes, allowed to stand for an hour, and then poured in a thin stream into five or six times the volume of water. The bromide of silver collodion is, of course, precipitated and should be collected on a clean linen cloth, the ends of which are tied together so as to form a bag, and this placed in running water for one or two hours to wash. The emulsion is then pressed gently to remove the excess of water, placed on a thick pad of pure filter paper to dry, which takes one or two days. When absolutely dry, which may be known by breaking one or two of the larger pieces of emulsion up, it may be preserved indefinitely in a bottle in an absolutely dark place, or may be used to form the raw collodion as follows:

Dry bromide silver collodion	6 grm.
Absolute alcohol	40 c. c.
Ether	63 c. c.

Dissolve by frequent shaking.

To make this collodion color-sensitive, dye solutions are added just before using. The solutions are made as follows:

1. Eosin Silver Solution.—

Eosin, crystal	4 grm.
Distilled water	50 c. c.
Alcohol, 95%	450 c. c.

2. Silver Solution.—

Silver nitrate	3·4 grm.
Distilled water	50 c. c.

Dissolve and add solution of ammonia till the precipitate first formed is redissolved, and add—

Alcohol, 96%, to make	200 c. c.

3. Ammonium Picrate Solution.—

Picric acid	3 grm.
Distilled water	10 grm.
Ammonia solution, q. s. to exactly neutralize alcohol, 96% to	300 c. c.

For use mix—

Solution 1	75 c. c.
Solution 2	30 c. c.
Solution 3	30 c. c.
Pure glycerine	20 c. c.
Alcohol, 96%	45 c. c.

This eosin silver solution should be allowed to settle for one or two days, then filtered, and 20 c. c. of the same should be mixed with 100 c. c. of raw emulsion.

Erythrosin Silver Solution.—

Erythrosin, pure	4 grm.
Distilled water	50 c. c.
Alcohol, 96%	450 c. c.

Dissolve.

The above mentioned solutions of silver and picrate of ammonia are also used for making the following stock solution:

Solution 1	75 c. c.
Solution 2	30 c. c.
Solution 3	30 c. c.
Pure glycerine	25 c. c.
Alcohol, 96%	120 c. c.
Distilled water	20 c. c.

The cloudy solution thus obtained is allowed to stand for a quarter of an hour, and then liq. ammonia added, drop by drop, till it becomes quite clear; the solution is then kept in a corked bottle for one or two days to settle, then filtered, and 20 c. c. added to every 100 c. c. of emulsion immediately before use.

Eosin and erythrosin sensitive bromide of silver for yellow and yellowish green, the maximum effect being visible at D½E, or midway between the yellow and green. Eosin gives soft harmonious negatives, erythrosin somewhat harder or more contrasted negatives. Too sensitive for red and orange, it is necessary to use cyanin, preferably the chloro-cyanin, as follows: 0·3 grm. of chloro-cyanin should be dissolved in 50 c. c. of water, and 10 c. c. of this solution added to 100 c. c. of raw emulsion and 1 c. c. of pure glycerine. The cyanin emulsion should then be mixed with an equal quantity of erythrosin emulsion, and one thus obtains a sensitiveness ranging from A in the red to H in the violet.

The dyed emulsions will not keep more than two days, and should be twice filtered through a clean pad of cotton wool before coating the plates.

Eosin silver emulsion, with 51 mg. of free silver nitrate added to every 100 c. c. of emulsion, showed 21° Warnerke; without excess of silver, 17° W.; erythrosin silver giving respectively 21° W. and 15° W.; the cyanin erythrosin silver emulsion giving 13° W.; therefore the sensitiveness of these plates is equal to that of the ordinary and rapid gelatine dry plate.

The eosin and erythrosin silver solutions are sensitive to light, and must therefore be made and kept in the dark.

As with all collodion emulsions, the plates should receive a substratum, preferably of gelatine solution 1% with 1½% of acetic acid, and 2% of alcohol. The plates are coated exactly in the same way as with the old wet plate collodion, and as soon as the collodion has set the plate is exposed, but it will keep damp for thirty or forty minutes without any fear of ill results. After exposure, the plate is well washed under a stream of running water until the greasy marks no longer show, then propped up for a minute to drain, and then flooded with the developer, which is made up as follows:

Stock Solution A.

Distilled water	500 grm.
Sodium sulphite	200 grm.
Carbonate of potash from the tartrate	200 grm.

Stock Solution B.

Hydroquinone	25 grm.
Alcohol, 96%	100 c. c.

Stock Solution C.

Ammonium bromide	25 grm.
Distilled water	100 c. c.

The concentrated developer is made up of—

Solution A	100 c. c.
Solution B	5 c. c.
Solution C	7 c. c.

The actual developer of—

Concentrated developer.....	150 c. c.
Distilled water.....	1,000 c. c.

The character of the negative may, of course, be altered by increasing or decreasing the quantity of concentrated developer or the proportions of the several ingredients—the hydroquinone giving density, the bromide clearness, and the potash accelerating.

When the image has sufficiently developed, it can either be intensified with the usual acid pyrogallol and silver intensifier, after washing, or it may be fixed in hypo, washed, and then intensified with the above intensifier, or the mercury and sulphite, as used for gelatine plates.

Ozotype Printing Process.—This process has been recently introduced by Mr. Manly before the Royal Photographic Society of Great Britain, and has the merit of simplicity and permanency which belong to the well-known carbon process. The following is a description of the process taken from *The American Amateur Photographer:*

Any good paper, such as Whatman's and Arnold's, is first coated with a sizing by floating it upon a 2 per cent. solution of gelatine. After drying, the paper is then coated by brushing over with a solution of a chromic and a manganous salt, and dried and then printed in the usual way under a negative by sunlight, which gives an easily seen brownish-yellow colored image. The chromic salt under the influence of light gives up a part of its oxygen to the manganous, which thereby changes into a manganic state. The print is then washed to eliminate the soluble salts and dried, and in that state will keep indefinitely. After this a piece of unsensitized carbon tissue, which may be of any desired color, is immersed in a solution of acetic acid and hydroquinone, or any of the phenol derivatives used in developers. The dried print is also immersed in this same solution just long enough to get moist. The two are then withdrawn, the film side of the carbon tissue being in contact with the surface of the print. They are then squeegeed together, and as soon as dry, or any convenient time thereafter, are soaked in cold water for half an hour. They are then transferred to warm water, and in a short time the paper backing of the tissue falls off or is easily removed and the unaltered pigmented gelatine is washed away. The following is the working formula for experimental purposes, and can be varied to suit other conditions:

Sensitizing Solution.

Water.....	100 grm., 3 oz. 1 drm.
Potassium bichromate	7 grm., 1¾ drm.
Manganous sulphate .	14 grm., 210 grn.

This may be applied to the paper by a buckle brush, spread with a glass rod, or any of the various methods known to photographers, and then hung up to dry in the dark room.

Hydroquinone Acid Bath.

Acetic acid (glacial).	3 c. c., 1 drm.
Water.....	1,000 c. c., 31 oz.
Hydroquinone.....	1 grm., 15 grn.

The temperature of the hydroquinone acid bath should be between 65° and 75° F. Rough paper requires printing longer than plain paper, and the contrast is increased by increasing the acid, and softness is obtained by increasing the quantity of hydroquinone. In case the image is insufficiently printed prior to the squeegeeing and contact thereof of the carbon tissue, it may be re-enforced or brought up to a greater degree of density by using the following additional developer, which is prepared as follows: First a stock solution is made, dissolving in—

Water.....	2 oz.
Nitrate of silver.....	100 grn.
Sulpho-cyanide of ammonia....	245 grn.

The solution is then shaken up until it becomes clear, and then increased with water until it measures 10 oz. This solution will become quite milky, but may be cleared by adding, drop by drop, a saturated solution of hyposulphite of soda, care being taken not to add more than is necessary. It is better to stop just short of its being perfectly clear. This solution should be kept in a dark room.

The developer is as follows, prepared in 10 per cent. solution:

Pyro solution.....	30 min.
Potassium bromide solution	20 min.
Ammonia solution.....	60 min.
Nitrate silver solution (stock solution).....	1 oz.

This developer may be used in place of hydroquinone if desired, and is said to work well.

Phosphorescent Prints.—Water, 500 c. cm.; white gelatine, 125 grm.; glycerine, 1 grm. The solution is made over a water bath, and while the mixture is well stirred, 350 grm. of phosphorescent sulphide of calcium, mixed with a little sub-nitrate of bismuth, is added. The paper is coated with two layers of the mixture, and afterward a layer of copal varnish or shellac may be given if it is to be much exposed. This process is said to succeed very well either with negatives or superposed objects.

Photographing on Wood, using Dry Plates.—Gelatine, 2 drm.; white curd soap, 2 drm.; water, 16 oz. Soak gelatine for some hours, then dissolve in a bath of hot water. Add the soap in small shavings, stir with a glass rod or slate pencil till completely mixed, then add powdered alum until the froth produced disappears; strain through muslin. The block is now coated with this mixture and a little zinc white, rubbed well into the wood, with the thinnest coating possible, and finished off smoothly and evenly all over, and left to dry. It is then brushed over with the following composition, a camel hair brush being used. It is advisable to use a wide one, to prevent streaks in the finished block: Albumen, 1 oz.; water, 6 drm.; ammonium chloride, 18 grn.; citric acid, 5 grn.

Beat the albumen to froth and allow to settle, using the clean portion, add the water, then the ammonium chloride, mixing well with rod; finally the acid. One coating with the brush from end to end of the block in one sweep is quite sufficient. When the block is dry pour over a small quantity of silver solution, made by dissolving nitrate of silver, 50 grn.; water, distilled, 1 oz.

Move the solution over the surface by the aid of a glass rod, and pour off the surplus into another bottle for filtering for further use. When dry, print the block under a reversed negative to just the depth you require, as there is hardly any loss in the finishing. When printed, hold the block face down in a dish of strong salt and water for three minutes. This will cause the print to fade a little. Wash under a spray of water, and fix in a saturated solution of hypo, by holding the block face down on the bath for about five minutes; this will bring back all detail; finally wash for about ten minutes, stand on end to dry; the block is then ready to be engraved. The picture may be toned, but this is not necessary. In order to make the reversed negative it is only needful to take the photograph through the film, care being taken to have the glass quite clean. Another method would be—strip and turn the film by means of a solution of hydrofluoric acid. In case you make a negative through the film, remember to turn the focusing glass around.

Platinotype Prints, How to Improve.—Mr. Frank Wonderly, in *The American Journal of Photography*, says: An imperfect print can be improved in several ways. For instance, if the color of the print is to remain the same, that is,

black, Baron Hubl's formula is perhaps the best of any. For it are required:

A.—Sodium formate..... .. 48 grn.
Water .. .. 1 oz.

B.—Platinum perchloride ..... 10 grn.
Water .... 1 oz.

Take 15 drops of each and 2 oz. of water, immerse the print therein until the desired depth of color is attained, and then wash it well and dry it.

If it is desired to change the color to a warmer tone than black, Packham's method will be found to work well. The toning solution is compounded as follows: Tincture of catechu, 1 oz.; water, 16 oz. Boil five minutes and allow to cool; then add 4 oz. of alcohol. This forms a stock solution.

Take 40 drops of this to every 16 oz. of water, heated to about 70° F. Immerse the prints, and turn them over occasionally, during five or six hours, according to the depth of color desired. If the bath is kept up to 150° F., the change of color is much more rapid, and may be reduced to as many minutes, but there is a liability to get uneven tones, and it is necessary to keep the prints in constant motion. Cold water checks the toning action. If the water contains lime, 2 grn. of potassium oxalate to each pint counteracts the staining action it would otherwise exercise.

Uranium toning also gives browns and reds. Before using the uranium bath care should be taken to get all the iron out of the paper, or there will be stains in the print. The prints must therefore be first placed in the acid bath. Two solutions are required for uranium toning as follows:

A.—Uranium nitrate..... 30 grn.
Glacial acetic acid ..... 3 drm.
Water..... 16 oz.

B.—Potassium ferricyanide..... 75 grn.
Glacial acetic acid.. ..... 3 drm.
Water..... 16 oz.

Take equal parts of each just before it is intended to use the solution. The toning is rather tardy, and may be stopped by placing the print in acid water, 1 part acid to 100 parts water. If after toning the print is placed in plain water the image will weaken gradually, so that the toning, if it has gone farther than desired, may be reduced. If there happens to be any alkali in the water, the image is entirely bleached out.

Baron Hubl recommends for blue tones placing the ordinary black print in the following:

A.—Ammonia-iron alum..... 160 grn.
Hydrochloric acid ..... 3 drm.
Water..... 2½ oz.

B.—Potassium ferricyanide.. 160 grn.
Water..... 2½ oz.

C.—Ammonium - sulphocyanide..... ..... 1½ oz.
Water..... 3½ oz.

Mix 80 min. of A with 34 oz. of water; then successively add to it 30 min. of B and 90 min. of C.

Printing Papers.—Lead Printing Paper.—To prepare a lead printing proceed as follows: Lay some coarse drawing paper (such as contains starch) on an 8 per cent. potassium iodide solution. After a moment take it out and dry. Next, in the dark room lay the paper face downward on an 8 per cent. lead nitrate solution. This sensitizes the paper. Again let dry. The paper is now ready for printing. This process should be carried on till all the detail is out in a grayish color. Then develop in a 10 per cent. ammonium chloride solution. The tones obtained are of a fine blue black.—*Revue Scientifique.*

Oxalate Silver Printing Papers.—M. Van Loo, a Belgian photographer, gives a method of preparing a photographic paper somewhat resembling platinotype, but much less expensive. The paper is coated with the following solution:

Water..... .... 100 parts.
Ferric oxalate..... 15 parts.
Oxalic acid ..... 3 parts.
Nitrate silver..... 3 parts.

The above proportions should be adhered to as nearly as possible to secure good results. The printing is carried out in the same manner as with platinum paper; that is, until the image is well distinguished. After printing, the paper is placed in a developing bath made up as follows:

Water.....100 parts.
Borax..... ..... 60 parts.
Tartrate soda..... 60 parts.

Dissolve, and add several drops of a 5 per cent. solution of potassium bichromate; a greater proportion of bichromate gives an image hard and full of contrast; by using less, the image becomes gray and feeble. A certain latitude is thus given, which is of advantage for negatives of different intensities. After the development, which lasts five or six minutes, the prints are washed for a few moments in running water and the toning is carried out with the following bath:

Water .....100 parts.
Potassium chloroplatinite..... 1 part.
Common salt ..... 10 parts.
Citric acid..... 10 parts.

The prints are left in the bath until the desired intensity is obtained, and are then fixed in a 2 per cent. solution of ammonia; the fixing lasts about ten minutes. They are then washed thoroughly, as usual.

Reducers for Negatives and Positives.—Ammonium Persulphate.—The true formula for this chemical is NH_4SO_4, and it is said to be produced by electrolysis from the hydrogen sulphate, and was introduced, according to *The American Amateur Photographer*, early in 1899, by Messrs. Lumière Bros. The peculiarity of this reducer is that it attacks the denser portions of the negative rather than the weaker deposits, so that the details in the half-tones of the negative remain undisturbed, and the hardness of the high lights is reduced. The strength of the solution may be varied according to the rapidity with which the reduction is to be effected.

The following formula is in general use:

Water..... ..... 1 oz.
Ammonium persulphate..... 20 grn.

To know that the ammonium persulphate is of the right quality, a peculiar crackling sound will be observed when it is put in the water to be dissolved, and while in use in the tray it will have a peculiar sulphur-ammonia odor.

Permanganate of Potassium Reducer.—Professor R. Namias, in *Photography*, advises the following formula for softening negatives which are too hard, and also recommends it for reducing over-developed bromide prints:

Potassium permanganate... ½ grm., 8 grn.
Commercial sulphuric acid. 1 c. c., 15 min.
Water .... 1,000 c. c., 31 oz.

If the negative appears to have a slight yellow tinge when removed from this solution, after the requisite reduction has been effected, it is immersed in 1 per cent. solution of oxalic acid, which entirely removes the stain.

Another formula of this compound is recommended for collodion negatives, specially in process work, where it is desired to clear up the shadows or transparent places around the dots. For this purpose a stock solution is prepared composed as follows:

Water..... .. .. 1,000 c. c., 31 oz.
Potassium permanganate... 2 grm., 30 grn.
Commercial sulphuric acid.. 20 c. c., 5 drm.

This solution will keep for a long time if placed in the dark. For use on collodion nega-

tives add 1 oz. of above to 9 oz. of water. When this solution is placed on a collodion negative, it will immediately attack the clear portions of the negative and leave the dense portions intact. It will also clear away any fog in the negatives. After the solution has been used once, it should be thrown away and not used a second time.

A One Solution Reducer.—The following formula for a good all around reducer of density is given by Herr Belitski, of Nordhausen:

Potassio-ferric oxalate.....	15 parts.
Neutral sodium sulphite.....	15 parts.
Distilled water.....	300 parts.

The solution is of a blood red color, due to the ferric sulphite formed. Add—

Oxalic acid, crystals..... 5 parts

and shake till the solution becomes green; then decant from the undissolved acid, and add—

Hyposulphite of soda crystals.. 75 parts.

Shake till dissolved, and filter. Keep in well closed bottles, protected from light.

The negative which it is desired to reduce should be well rinsed when it comes from the fixing bath, and laid in the reducer; when the action has proceeded far enough, wash quickly and dry. The solution may be used over and over again until it becomes yellow, when its reducing powers are exhausted.—*Chemist and Druggist.*

Reversing Negatives and Positives, a Simple Method of.—This method is recommended by Prof. R. Namias, and as published in *Photography* is as follows:

An ordinary bromide plate is exposed behind a negative for somewhat more than would be considered an ordinary exposure, either to daylight or to Welsbach light, or an electric arc light, properly screened. Then the plate is developed in a glycin developer composed as follows:

Water.....	1,000 c. c.,	31 oz.
Sodium sulphite (crystals) c. p.....	30 grm.,	1 oz.
Glycin.....	10 grm.,	150 grn.
Potassium carbonate.	50 grm.,	1½ oz.
Potassium bromide...	1 grm.,	15 grn.

The plate is left in this solution until the image has developed to such an extent that the high lights, which correspond to the transparent parts of the negative, have developed entirely through the film to the back. This is observed by looking at the developed plate on the glass side. It generally requires a development of half an hour in order to obtain this result. It does not matter if the negative fogs over. When sufficiently developed, the plate is rinsed in water, and, instead of fixing, is immersed in the acidified solution of potassium permanganate. The following bath acts very quickly and does not attack the gelatine:

Water.....	1,000 c. c.,	31 oz.
Commercial sulphuric acid.....	20 c. c.,	5 drm.
Potassium permanganate	2 grm.,	30 grn.

The silver forming the image will dissolve very quickly, and when the whole of the black image has disappeared, the plate may be taken out, when on examination by transmitted light it will be found to bear a negative image, formed by the non-reduced silver bromide. This operation is done in the light. The plate, however, will have a brown appearance which may be removed by immersing in a 1 per cent. solution of oxalic acid. The negative image will then be seen much more clearly. The plate is then washed with water to eliminate the oxalic acid. Then it is developed a second time, in order to blacken the unreduced silver bromide, which now forms the negative image. The second development is not as easy as the first, but the best developer for this purpose is prepared as follows:

Water.....	1,000 c. c.,	31 oz.
Sodium sulphite (cryst.) c. p..	40 grm.,	1 oz. 2 drm.
Metol.....	10 grm.,	150 grn.
Caustic soda....	5 grm.,	1¼ drm.

This development is carried on in a bright light and will take place very rapidly. It now only remains to wash the reversed negative thus obtained, for a short time, and then it may be dried. There is no necessity of fixing in a hypo solution. Should the duplicate negative thus obtained be too vigorous, it may be reduced by a very weak solution of acidified permanganate. The best results depend entirely upon the first development, which ought to be pushed as far as possible. Should the gelatine film of the plate be too soft, and show a tendency to give blisters when in the permanganate solution, this can be prevented by adding a little alum to the solution.

Stripping Negative Films from Glass.—The following is effective and will strip a film without enlarging it, which is just what is wanted:

Distilled water.....	500 c. c., 15 oz. 5 drm.
Alcohol	500 c. c., 15 oz. 5 drm.
Glycerine.....	40 c. c., 1 oz. 2 drm.
Hydrofluoric acid.....	80 c. c., 2 oz. 4 drm.

In this the negative should be placed till it begins to lift at the corners, then it should be transferred to a dish of clean water, when it can be readily coaxed from the glass with a soft brush, and transferred to a clean glass coated with gelatine. An almost better way is to simply leave the negative in the solution till it begins to lift well at the corners, then remove, squeegee a piece of clean writing paper down on to it, and in a very short time the paper may be lifted and with it the film, and the two squeegeed to a clean glass coated with gelatine, when the paper may be lifted. If the alcohol be omitted from the above, a solution is obtained which is very similar to that put up as a proprietary article for enlarging negatives by extension of the film. If a powder of similar action is required, one may use a mixture of—

Sodium fluoride ...	120 grm., 3 oz. 6 drm.
Citric acid.....	240 grm., 7 oz. 4 drm.

Directing this to be dissolved in 1,000 c. c., or 32 oz. of water. It is, of course, needless to point out that the solution given above must be stored in an India rubber bottle, or one well coated inside with paraffine wax.—*Pharmaceutical Journal.*

Toning Prints.—A Combined Toning Bath Without Lead.—

Hypo.....	240 grm.,	7 oz. 4 drm.
Ammonium sulphocyanide	24 grm.,	6 drm.
Sodium acetate (fused)....	48 grm.,	1½ oz.
Distilled water to.....	1,000 c. c.,	32 oz.

To this, just before use, add 1 grm. or 15 grn. of neutral chloride of gold.

Reinforcing Platinum Prints.—It is sometimes difficult, if one has not had considerable practice in the exposure of platinotype paper, to obtain a satisfactory result upon the first trials. It often happens that the prints which have been judged to be sufficiently exposed give only gray tones upon development. The reinforcing bath given in the following formula enables one to strengthen the tones:

Solution A.

Saturated solution gallic acid...	50 c. c., 1½ oz.
Saturated solution nitrate silver,	2 c. c., 30 min.
Acetic acid, glacial....	10 drops.
Water.....	50 c. c., 1½ oz.

Solution B.

Chloroplatinite potassium.....	1 grm., 15 grn.
Phosphoric acid.....	15 c. c., 4 drm.
Water.....	600 c. c., 18 oz.

The prints are plunged into pure water, then into Solution A until the desired reinforcement is obtained. During this time they should be constantly agitated. They are then washed in three changes of water, to which a small proportion of acetic acid has been added, and are toned in Solution B until a good black is obtained. The prints are finally washed as usual.

The Ferrocyanide of Copper Method of Toning Lantern Slides and Silver Prints.—The ingredients, potassium citrate, copper sulphate, and potassium ferricyanide, are first made up into 10 per cent. solutions in which state they will keep indefinitely, but should not be mixed until they are about to be used. The following is the formula, and the solutions must be mixed in the order prescribed:

Copper sulphate (10 per cent. solution), 75 c. cm., 2 oz. 3 drm.; potassium citrate (neutral), 570 c. cm., 7 oz. 2½ drm.; potassium ferricyanide, 66 c. cm., 2 oz. 3 min.

To prepare 10 per cent. solutions it will be sufficient to say, that as the dealer's ounce contains 437·5 grn., all that is necessary to make that quantity into a 10 per cent. solution is to mark a bottle at the point reached by 9 oz. and 50 min. of water, put the ounce into the bottle, and fill with water to that point. Each measured minim of such a solution will contain 1 grn. of the substance in solution. With liquids instead of solids, the bottle should be marked at the ten-ounce point, a measured ounce placed in the bottle, and the bottle filled up to the mark with water.

In toning with this solution of cupric ferricyanide in potassium citrate, the soluble ferri salt is supposed to be by the action of the silver of the image reduced to the insoluble ferro, which is deposited in situ; and being a bright red, the various shades of color arise from the black of the original image showing less and less through that red until it ceases to show at all. The method of toning is simplicity itself, all that is necessary being to place the developed, fixed and washed slide or print in the solution, and when the desired color has been reached, to wash in a few changes of water. After use the solution is thrown away.

Tones from a deep black to a bright cherry red may be obtained according to the time the slide or print is left in the solution. This process was perfected in 1900 by Mr. W. B. Ferguson, of London.

Toning Bath for Solio Paper.—The following directions are given by *The Photographic Times*: Print, in direct sunlight, covering thin negatives with tissue paper, allowing the print to get a little darker tint than the finished print should be. Place print without previous washing into the following:

Combined Toning and Fixing Bath.

To tone thirty cabinets take—

Stock solution A	8 oz.
Stock solution B	1 oz.

Stock Solution A.

Sodium hyposulphite	8 oz.
Common alum	6 oz.
Water	80 oz.

When dissolved add 2 oz. of borax dissolved in 8 oz. hot water. Let stand over night and decant clear liquid.

Stock Solution B.

Chloride of gold	15 grn.
Lead acetate	65 grn.
Water	8 oz.

Tone to desired color, and immerse prints for five minutes in the following salt solution to stop the toning:

Salt	4 oz.
Water	32 oz.

Wash one hour in running water or in sixteen changes of cold water, when prints may be mounted same as albumen prints. The following hints are suggested: All solutions should be used as cold as possible. In warm weather prints should not stand over night before mounting. Mounted prints must be thoroughly dry before burnishing.

Transferring Photo Resists to Steel for Decorative Etching.—A continental technical writer describes an interesting development of photographic methods of decorating metal, and more particularly steel. The first necessity for the method now detailed is a specially deep intaglio plate, such extra depth being required as is essential in the ordinary methods of transfer printing on earthenware or on glass, and in direct printing (from intaglio rollers) on textiles. This intaglio plate of extra depth is made from a photographic positive transparency. We assume the positive is grained by the use of the ruled screen, and the fish glue process of sensitizing the metal is employed, but before etching the copper plate it is dusted in the graining box as ordinarly used for the Klic process of photogravure. In this way considerable depth may be obtained, together with that roughness of the hollows which is so essential for the proper holding of the printing ink or resist. The ink or resist sold in this particular case is a waxy mixture, which is practically solid when cold, so obviously the plate must be warmed for the operation of filling in. The excess of ink or resist is now scraped off as completely as possible with a spatula or other suitable tool, and when the plate is cold a final cleaning is given with a tuft of cotton moistened with alcohol. A print is now made on transparent lithographic transfer paper, and this is transferred to the slightly warmed steel surface, much in the same way as pottery transfers are put down. The paper being soaked off, all is ready for etching. This method is said to be easy after a little practice, and the adhesion of the resist to the metal highly satisfactory. Additions by hand or retouching may be readily made. A simple solution of sulphate of copper may be used as a mordant.

Etching on Steel.—Nitric or hydrochloric acids, or mixtures of the two, are employed as the "acid" in marking or etching on steel. The following are among the methods employed:

1. Glacial acetic acid, 4 parts, is mixed with absolute alcohol 1 part, and nitric acid (sp. gr. 1·28) 1 part. Allow the acetic acid and alcohol to remain for half an hour, then add nitric acid carefully. Etch from one to fifteen minutes. Of course, the parts you wish to protect from corrosion must be covered with beeswax, tallow, or some similar substance.

2. Cover the surface with a thin coat of asphaltum varnish of fine quality, then cut the design through the surface of the steel and etch with a weak solution of nitric acid in water; finally, wash with hot water and remove the asphaltum with turpentine.

3. Clean the steel and cover evenly with wax, cut the lines with a steel point through the wax, and pour on the following etching fluid: Pyroligenious acid, 4 oz.; alcohol, 1 oz.; nitric acid, 1 oz. by measure. Or use iodine, 1 oz.; iron filings, ½ drm.; water, 4 oz. The etching fluid is to be removed as soon as the metal is sufficiently etched.—*Process Review.*

Treatment of Exposed or Fogged Plates.—It is found that the acidified solution of permanganate of potash, consisting of ½ grm. of permanganate, 1 c. c. of sulphuric acid, and 1,000 c.c. of water, has the property, when flowed over a gelatino-bromide sensitive plate, of entirely destroying the latent image. For this reason, if a plate has been accidentally exposed to the light and becomes fogged thereby, it is only necessary in the dark room to flow it over with this reducer for a minute or two, then immerse it in a bath of weak oxalic acid and dry it. This eliminates all fog and renders the plate less sensitive than it was before, but its sensitive-

ness can be increased by subsequently immersing in the weak solution of ammonia and drying, when the primary sensitiveness will be nearly restored, and the plate can be used in the camera or for contact work as if it was a fresh plate.

Watch Dials, Photographs on.—For the production of photographic pictures on watch dials, the following method of procedure is recommended:

Beat the white of an egg, with addition of a little ammonia, to a white foam; add 300 c. c. (9 oz. 3 drm.) of water and beat again. After the egg has settled, filter and let the liquid run once over the dial, which has previously been thoroughly cleaned with ammonia. After the surplus has run off, coat once more and allow to dry.

The sensitive collodion is now produced as follows:

Dissolve 0·6 grm. (9 grn.) chloride of zinc in 20 c. c. (5 drm.) of alcohol; add 0·5 grm. collodion cotton and 26 c. c. (6½ drm.) of ether, and shake the whole forcibly. Then dissolve 1·5 grm. (22 grn.) of nitrate of silver in hot water, add 6 c. c. (1½ drm.) of alcohol, and keep the whole in solution by heating. The silver solution is now added in small quantities at a time to the collodion, which must have well settled. This, of course, is done in the dark room.

After 24 hours the emulsion is filtered by passing it through cotton moistened with alcohol. This durable collodion emulsion is now flowed in the usual way thinly upon the prepared watch dial, which, after the collodion has coagulated, is moved up and down in distilled water until the fatty stripes have disappeared. The water is then changed once, and the dial is, after a short immersion, left to dry upon blotting paper. It is now ready for exposure. Expose under the original magnesium light and develop with a citrate oxalate developer, or in the following hydroquinone developer:

Hydroquinone...	4 grm., 1 drm
Bromide of potassium.	25 grm., 6 drm.
Sulphite of soda.....	48 grm., 1½ oz.
Carbonate of soda.....	10 grm., 2½ drm.
Water... .....450 c. c., 14 oz.	

After fixing and drying, coat with a transparent positive varnish.

In place of the developing process, the printing out process with chloride of silver collodion can also be applied, with the advantage that the pictures can be toned. The collodion for this purpose is made in the following way:

Dissolve 8 grm. (2 drm.) collodion cotton in 100 c. c. (3 oz. 1 drm.) of ether, and 100 c. c. (3 oz. 1 drm) of alcohol; add 0·3 grm. (45 grn.) chloride of strontium, and then 0·2 grm. (30 grn.) chloride of lithium, which has previously been dissolved in 2 c. c. (½ drm.) of hot water. To this solution add also 1 grm. (15 grn.) citric acid which has been dissolved in alcohol slightly heated. The solution is left standing for 24 hours, and is then filtered through cotton. The prepared dial is coated in the ordinary way with this emulsion, and printed, after which it is toned as usual.—*American Druggist.*

Phylloxera, Remedy for.—The introduction of American plants to replace those destroyed by parasites in French vineyards has not arrested the use of insecticides for the protection of French vines still attacked by *phylloxera*, and for this purpose carbon bisulphide (either pure or dissolved in water), sulpho-carbonates, and submersion continue to be employed with more or less success. The carbon bisulphide is by far the more efficient, but is too volatile and does not diffuse with sufficient rapidity. When, however, it is mixed with vaseline, its volatility is reduced and its diffusibility is increased, the former proving advantageous in light and calcareous soils, the latter in heavy soils, in accordance with theoretical considerations. The vaselined sulphide is applied in the same way as the ordinary sulphide, depositing some at the foot of the vine-stock and spreading the rest over the surface; this treatment is found to be effectual; with it *phylloxera* is no longer seen in the roots, vegetation is luxuriant, and numerous new rootlets indicate a decisive increase in vitality; the manuring on a test tract of land had not been altered for six years, therefore the improvement was solely due to insecticide.—*P. Cazeneuve.*

Pickles, Sauces and Catsups.—The formulas in this section are arranged as follows: Pickles, Sauces, Mustards, Catsups.

Pickles.—An Excellent Way of Preserving Cucumbers.—Salt and water, 1 lb. of lump sugar, the rind of 1 oz. of ginger, cucumbers. Choose the greenest cucumbers, and those most free from seeds; put them in strong salt and water, with a cabbage leaf to keep them down; tie a paper over them, and put them in a warm place till they are yellow; then wash them and set them over a fire in fresh water, with very little salt, and another cabbage leaf over them; cover very closely, but take care they do not boil. If they are not a fine green, change the water again, cover them as before, and make them hot. When they are a good color, take them off the fire and let them cool; cut them in quarters, take out the seeds and pulp, and put them into cold water. Let them remain for 2 days, changing the water twice each day to draw out the salt. Put the sugar, with half a pint of water, in a saucepan over the fire; remove the scum as it rises, and add lemon peel and ginger with the outside scraped off: when the syrup is tolerably thick, take it off the fire, and when cold, wipe the cucumbers dry, and put them in. Boil the syrup once in 2 or 3 days for 3 weeks; strengthen it if required, and let it be quite cold before the cucumbers are put in. Great attention must be paid to the directions in the commencement of this recipe, as, if these are not properly carried out, the result will be far from satisfactory. This recipe should be used in June, July or August.

An Excellent Pickle.—Equal quantities of medium-sized onions, cucumbers and sauce apples; 1½ teaspoonfuls of salt, ¾ teaspoonful of cayenne, 1 wineglassful of soy, 1 wineglassful of sherry; vinegar. Slice sufficient cucumbers, onions and apples to fill a pint stone jar, taking care to cut the slices very thin; arrange them in alternate layers, shaking in as you proceed salt and cayenne in the above proportion; pour in the soy and wine, and fill up with vinegar. It will be fit for use the day it is made. Seasonable in August and September.

Soy: This is a sauce frequently made use of for fish, and comes from Japan, where it is prepared from the seeds of a plant called Dolichos soja. The Chinese also manufacture it; but that made by the Japanese is said to be the best. All sorts of statements have been made respecting the very general adulteration of this article in England, and we fear that many of them are too true. When genuine, it is of an agreeable flavor, thick and of a clear brown color.

Pickled Gherkins.—Salt and water, 1 oz. of bruised ginger, ½ oz. of whole black pepper, ¼ oz. of whole allspice, 4 cloves, 2 blades of mace, a little horseradish. This proportion of pepper, spices, etc., for a quart of vinegar. Let the gherkins remain in salt and water for 3 or 4 days, then take them out, wipe perfectly dry, and put them into a stone jar. Boil sufficient vinegar to cover them, with spices and pepper, etc., in the above proportion, for 10 minutes; pour it quite boiling over the gherkins, cover the jar with vine leaves, and put over them a plate, setting them near the fire, where they must remain all night. Next day drain off the vinegar, boil it up again, and pour it hot over them. Cover up with fresh leaves, and let the whole remain till quite cold.

Now tie down closely with bladder to exclude the air, and in a month or two they will be fit for use. Time: 4 days. Seasonable from the middle of July to the end of August. Gherkins are young cucumbers; and the only way in which they are used for cooking purposes is pickling them, as by the recipe here given. Not having arrived at maturity, they have not, of course, so strongly a developed flavor as cucumbers, and, as a pickle, they are very general favorites.

Indian Pickle.—To each gallon of vinegar allow 6 cloves of garlic, 12 shalots, 2 sticks of sliced horseradish, ¼ lb. of bruised ginger, 2 oz. of whole black pepper, 1 oz. of long pepper, 1 oz. of allspice, 12 cloves, ¼ oz. of cayenne, 2 oz. of mustard seed, ¼ lb. of mustard, 1 oz. of turmeric; a white cabbage, cauliflowers, radish pods, French beans, gherkins, small round pickling onions, nasturtiums, capsicums, chilies, etc. Cut the cabbage, which must be hard and white, into slices, and the cauliflowers into small branches; sprinkle salt over them in a large dish, and let them remain two days; then dry them and put them into a very large jar, with garlic, shalots, horseradish, ginger, pepper, allspice and cloves in the above proportions. Boil sufficient vinegar to cover them, which pour over, and when cold, cover up to keep them free from dust. As the other things for the pickle ripen at different times, they may be added as they are ready; these will be radish pods, French beans, gherkins, small onions, nasturtiums, capsicums, chilies, etc. As these are procured, they must, first of all, be washed in a little cold vinegar, wiped, and then simply added to the other ingredients, in the large jar, only taking care that they are covered by the vinegar. If more vinegar should be wanted to add to the pickle, do not omit to boil it before adding it to the rest. When you have collected all the things you require, turn all out into a large pan, and thoroughly mix them. Now put the mixed vegetables into smaller jars, without any of the vinegar; then boil the vinegar again, adding as much more as will be required to fill the different jars, and also cayenne, mustard seed, turmeric and mustard, which must be well mixed with a little cold vinegar, allowing the quantities named above to each gallon of vinegar. Pour the vinegar, boiling hot, over the pickle, and, when cold, tie down with a bladder. If the pickle is wanted for immediate use, the vinegar should be boiled twice more, but the better way is to make it during one season for use during the next. It will keep for years, if care is taken that the vegetables are quite covered by the vinegar. This recipe was taken from the directions of a lady whose pickle was always pronounced excellent by all who tasted it, and who has, for many years, exactly followed the recipe given above.

Note.—For small families, perhaps, the above quantity of pickle will be considered too large; but this may be decreased at pleasure, taking care to properly proportion the various ingredients.

Pickled Nasturtiums.—(A very good substitute for capers.) To each pint of vinegar, 1 oz. of salt, 6 peppercorns, nasturtiums. Gather the nasturtium pods on a dry day, and wipe them clean with a cloth; put them in a dry glass bottle, with vinegar, salt and pepper, in the above proportion. If you cannot find enough ripe to fill a bottle, cork up what you have got until you have some more fit; they may be added from day to day. Bung up the bottles, and seal or rosin the tops. They will be fit for use in 10 or 12 months; and the best way is to make them one season for the next. Look for nasturtium pods from the end of July to the end of August.

Pickled Onions.—1 gal. of pickling onions, salt and water, milk; to each ½ gal. of vinegar, 1 oz. of bruised ginger, ¼ teaspoonful of cayenne, 1 oz. of allspice, 1 oz. of whole black pepper, ¼ oz. of whole nutmeg bruised, 8 cloves, ¼ oz. of mace. Gather the onions, which should not be too small, when they are quite dry and ripe; wipe off the dirt, but do not pare them; make a strong solution of salt and water, into which put the onions, and change this, morning and night, for three days, and save the last brine they are put in. Then take the outside skin off, and put them into a tin saucepan capable of holding them all, as they are always better done together. Now take equal quantities of milk and the last salt and water the onions were in, and pour this to them; to this add two large spoonfuls of salt, put them over the fire and watch them very attentively. Keep constantly turning the onions about with a wooden skimmer, those at the bottom to the top, and *vice versa*; and let the milk and water run through the holes of the skimmer. Remember, the onions must never boil, for if they do they will be good for nothing; and they should be quite transparent. Keep the onions stirred for a few minutes, and, in stirring them, be particular not to break them. Then have ready a pan with a colander, into which turn the onions to drain, covering them with a cloth to keep in the steam. Place on a table an old cloth two or three times double; put the onions on it when quite hot, and over them an old piece of blanket; cover this closely over them, to keep in the steam. Let them remain till the next day, when they will be quite cold and look yellow and shriveled; take off the shriveled skins, when they should be as white as snow. Put them in a pan, make a pickle of vinegar and the remaining ingredients, boil all these up, and pour hot over the onions in the pan. Cover very closely to keep in all the steam and let them stand till the following day, when they will be quite cold. Put them into jars or bottles, well bunged, and a tablespoonful of the best olive oil on the top of each jar or bottle. Tie them down with bladder, and let them stand in a cool place for a month or six weeks, when they will be fit for use. They should be beautifully white, and eat crisp without the least softness, and will keep good many months. Time: Five days. Seasonable from the middle of July to the end of August.

Pickling Onions.—To each quart of vinegar, 2 teaspoonfuls of allspice, 2 teaspoonfuls of whole black pepper. Have the onions gathered when quite dry and ripe, and, with the fingers, take off the thin outside skin; then with a silver knife (steel should not be used, as it spoils the color of the onions) remove one more skin, when the onion will look quite clear. Have ready some very dry bottles or jars, and as fast as they are peeled put them in. Pour over sufficient cold vinegar to cover them, with pepper and allspice in the above proportions, taking care that each jar has its share of the latter ingredients. Tie down with bladder and put them in a dry place, and in a fortnight they will be fit for use. This is a most simple recipe and very delicious, the onions being nice and crisp. They should be eaten within six or eight months after being done, as the onions are liable to become soft. Seasonable from the middle of July to the end of August.

Pickled Spanish Onions.—Onions, vinegar; salt and cayenne to taste. Cut the onions in thin slices; put a layer of them in the bottom of a jar; sprinkle with salt and cayenne; then add another layer of onions and season as before, proceeding in this manner till the jar is full. Pour in sufficient vinegar to cover the whole, and the pickle will be fit for use in a month. May be had in England from September to February.

Pickled Oysters.—One hundred oysters; to each ½ pint of vinegar, 1 blade of pounded mace, 1 strip of lemon peel, 12 black peppercorns. Get the oysters in good condition, open them, place them in a saucepan, and let them

simmer in their own liquor for about ten minutes very gently; then take them out, one by one, and place them in a jar and cover them, when cold, with a pickle made as follows: Measure the oyster liquor; add to it the same quantity of vinegar, with mace, lemon peel and pepper in the above proportion and boil it for five minutes; when cold, pour over the oysters and tie them down very closely, as contact with the air spoils them. Seasonable from September to April.

Note.—Put this pickle away in small jars; because directly one is opened its contents should be immediately eaten, as they soon spoil. The pickle should not be kept more than two or three months.

Pickled Tomatoes and Onions.—One dozen of ripe tomatoes, their weight in onions, 1 qt. of vinegar, 1 teaspoonful of allspice, 2 oz. of black pepper. Choose ripe tomatoes, and wipe them dry; take off the skin of the onions and put, with the other ingredients, in a stew-pan, where let them gently simmer for eight hours. When cold, bottle and tie over with bladder. Time: Eight hours. This pickle should be made in autumn.

Universal Pickle.—To 6 qt. of vinegar allow 1 lb. of salt, ¼ lb. of ginger, 1 oz. of mace, ½ lb of shalots, 1 tablespoonful of cayenne, 2 oz. of mustard-seed, 1½ oz. of turmeric. Boil all the ingredients together for about twenty minutes; when cold, put them into a jar with whatever vegetables you choose, such as radish pods, French beans, cauliflowers, gherkins, etc., as these come into season; put them in fresh as you gather them, having previously wiped them perfectly free from moisture and grit. This pickle will be fit for use in about eight or nine months. Time: Twenty minutes. Make the pickle in May or June, to be ready for the various vegetables. As this pickle takes two or three months to make—that is to say, nearly that time will elapse before all the different vegetables are added—care must be taken to keep the jar which contains the pickle well covered, either with a closely-fitting lid, or a piece of bladder securely tied over, so as perfectly to exclude the air.

Pickled Walnuts.—One hundred walnuts, salt and water. To each quart of vinegar allow 2 oz. of whole black pepper, 1 oz. of allspice, 1 oz. of bruised ginger. Procure the walnuts while young; be careful they are not woody, and prick them well with a fork; prepare a strong brine of salt and water (4 pounds of salt to each gallon of water), into which put the walnuts, letting them remain nine days, and changing the brine every third day; drain them off, put them on a dish, place it in the sun until they become perfectly black, which will be in two or three days; have ready dry jars, into which place the walnuts, and do not quite fill the jars. Boil sufficient vinegar to cover them, for ten minutes, with spices in the above proportion, and pour it hot over the walnuts, which must be quite covered with the pickle, tie down with bladder and keep in a dry place. They will be fit for use in a month.—*Mrs. Beeton.*

Sauces.—A Good Table Sauce.—The following formula, if properly prepared, will make an elegant table sauce: Allspice, 2 parts; cloves, 1 part; black pepper, 1 part; ginger, 1 part; cayenne, 1 part; mustard (English), 16 parts; salt, 16 parts; shalots, 16 parts; brown sugar, 32-64 parts; tamarinds, 32 parts; curry powder (East Indian), 8 parts; California sherry, 120 parts; garlic, at discretion, q. s.: best malt or cider vinegar, q. s. to make 500 parts.

Sauce Aristocratique.—Green walnuts. To every pint of juice, 1 lb. of anchovies, 1 drm. of cloves, 1 drm. of mace, 1 drm. of Jamaica ginger bruised, 8 shalots. To every pint of the boiled liquor, ½ pt. of vinegar, ¼ pt. of port, 2 tablespoonfuls of soy. Pound the walnuts in a mortar, squeeze out the juice through a strainer, and let it stand to settle. Pour off the clear juice, and to every pint of it add anchovies, spice and cloves in the above proportion. Boil all these together till the anchovies are dissolved, then strain the juice again, put in the shalots (8 to every pint), and boil again. To every pint of the boiled liquor add vinegar, wine and soy, in the above quantities, and bottle off for use. Cork well and seal the corks. Make this sauce from the beginning to the middle of July, when walnuts are in perfection for sauces and pickling.

Carrack Sauce (for Cold Meat).—1 qt. of vinegar, 15 anchovies, 3 dessertspoonfuls of mango pickle, 8 dessertspoonfuls of walnut pickle, 5 dessertspoonfuls of mushroom catsup, 5 dessertspoonfuls of soy, 2 heads of garlic. Chop and slice the ingredients, then put all into a bottle and set it in a dry, warm place. Shake it regularly every day for a month when it will be ready to use. The mango pickle may be omitted.

Bengal Recipe for Making Mango Chutney.—1½ lb. of moist sugar, ¾ lb. of salt, ¼ lb. of garlic, ¼ lb. of onions, ¾ lb. powdered ginger, ¼ lb. of dried chilies, ¾ lb. of mustard seed, ¾ lb. of stoned raisins, 2 bottles of best vinegar, 30 large unripe sour apples. The sugar must be made into syrup; the garlic, onions, and ginger be finely pounded in a mortar; the mustard seed be washed in cold vinegar, and dried in the sun; the apples be peeled, cored, and sliced and boiled in a bottle and a half of the vinegar. When all this is done, and the apples are quite cold, put them into a large pan, and gradually mix the whole of the rest of the ingredients, including the remaining half bottle of vinegar. It must be well stirred until the whole is thoroughly blended, and then put into bottles for use. Tie a piece of wet bladder over the mouths of the bottles, after they are well corked. This chutney is very superior to any which can be bought, and one trial will prove it to be delicious.

Note.—This recipe was given by a native to an English lady who had long been a resident in India, and who, since her return to her native country, has become quite celebrated among her friends for the excellence of this Eastern relish.

Indian Chutney Sauce.—8 oz. of sharp, sour apples, pared and cored, 8 oz. of tomatoes, 8 oz. of salt, 8 oz. of brown sugar, 8 oz. of stoned raisins, 4 oz. of cayenne, 4 oz. of powdered ginger, 2 oz. of garlic, 2 oz. of shalots, 3 qt. of vinegar, 1 qt. lemon juice. Chop the apples in small square pieces, and add to them the other ingredients. Mix the whole well together, and put in a well-covered jar. Keep this in a warm place, and stir every day for a month, taking care to put on the lid after this operation; strain, but do not squeeze it dry; store it away in clean jars or bottles for use, and the liquor will serve as an excellent sauce for meat or fish. Make this sauce when tomatoes are in full season, that is, from the beginning of September to the end of October.

Store Sauce or Cherokee.—One-half oz. of cayenne pepper, 5 cloves of garlic, 2 tablespoonfuls of soy, 1 tablespoonful of walnut catsup, 1 pt. of vinegar. Boil all the ingredients gently for about half an hour; strain the liquor and bottle off for use. Time: One-half hour. Seasonable. This sauce can be made at any time.

Harvey Sauce.—One dozen of anchovies, 6 dessert-spoonfuls of soy, ditto of good walnut pickle, 3 heads of garlic, 2 shalots, 1 oz. of cayenne pepper, ¼ oz. of cochineal, 1 gal. of vinegar. Cut the anchovies small, but do not remove the bones. Chop the pickles, shalots and garlic; then put all the ingredients into a deep jar and let it stand fourteen days, stirring it well two or three times every day. Then strain through a jelly-bag till it is quite clear, bottle it and tie bladders over the corks.

Sauce of Herbs.—(For bottling.) One stick of horseradish, 2 shalots, 1 sprig each of winter savory, basilicum, marjoram and thyme, a

little tarragon, 4 cloves, juice of 1 lemon, 1 wineglassful of vinegar, 1 pt. of water, 1 teaspoonful of browning. Wash and scrape the horseradish, strip the sprigs of their leaves, slice the shalots thinly, and put all into a saucepan with the vinegar, lemon juice and water. Put in the browning, and as soon as the mixture boils, simmer very gently for fifteen minutes; then strain, and when quite cold put up in small bottles. This sauce is an excellent addition to gravies, or may be used in their stead. Time: About ½ hour. Seasonable at any time.

Sauce à la Militaire.—(Good with all kinds of meat, game, fish.) Six shalots, 1 clove of garlic, a handful each of thyme, basil, tarragon leaves, ½ oz. of bruised mustard seed, 2 laurel leaves, ¼ oz. of mace, ditto of cloves, ½ oz. of long pepper, 2 oz. of salt, 6 dessert-spoonfuls of very strong vinegar, juice of 1 lemon, 1 teaspoonful of grated Seville orange peel, ½ pt. of white wine. Shred the shalots and split the garlic; then put all the ingredients into an earthen jar, cover very closely, and put into an oven or on a hot hearth to infuse. Allow it to settle; then strain till quite clear; then bottle and cork closely. A small quantity only is required with the viands. Time: Two to three hours. Seasonable at any time.

Leamington Sauce.—Walnuts. To each quart of walnut juice allow 3 qt. of vinegar, 1 pt. of Indian soy, 1 oz. of cayenne, 2 oz. of shalots, ¾ oz. of garlic, ½ pt. of port. Be very particular in choosing the walnuts as soon as they appear in the market, for they are more easily bruised before they become hard and shelled. Pound them in a mortar to a pulp, strew some salt over them and let them remain thus for two or three days, occasionally stirring and moving them about. Press out the juice, and to each quart of walnut liquor allow the above proportion of vinegar, soy, cayenne, shalots, garlic, and port. Pound each ingredient separately in a mortar, then mix them well together, and store away for use in small bottles. The corks should be well sealed. This sauce should be made as soon as walnuts are obtainable, from the beginning to the middle of July.

Reading Sauce.—2½ pt. of walnut pickle, 1½ oz. of shalots, 1 qt. of spring water, ¾ pt. of Indian soy, ½ oz. of bruised ginger, ½ oz. of long pepper, 1 oz. of mustard seed, 1 anchovy, ½ oz. of cayenne, ½ oz. of dried sweet bay leaves. Bruise the shalots in a mortar, and put them in a stone jar with the walnut liquor; place it before the fire, and let it boil until reduced to 2 pt. Then into another jar put all the ingredients except the bay leaves, taking care that they are well bruised, so that the flavor may be thoroughly extracted; put this also before the fire, and let it boil for 1 hour, or rather more. When the contents of both jars are sufficiently cooked, mix them together, stirring them well as you mix them, and submit them to a slow boiling for half an hour; cover closely, and let them stand for 24 hours in a cool place; then open the jar and add the bay leaves; let it stand a week longer, closed down, when strain through a flannel bag, and it will be ready for use. The above quantities will make ½ gal. Time.—Altogether, 3 hours. Seasonable. This sauce may be made at any time.

Tomato Sauce.—1 doz. tomatoes, 2 teaspoonfuls of the best powdered ginger, 1 dessertspoonful of salt, 1 head of garlic chopped fine, 2 tablespoonfuls of vinegar, 1 dessertspoonful of chili vinegar (a small quantity of cayenne may be substituted for this). Choose ripe tomatoes, put them into a stone jar and stand them in a cool oven until quite tender; when cold, take the skins and stalks from them, mix the pulp with the liquor which is in the jar, but do not strain it; add the other ingredients, mix well together, and put it into well-sealed bottles. Stored away in a cool dry place, it will keep good for years. It is ready for use as soon as made, but the flavor is better after a week or two. Should it not appear to keep, turn it out, and boil it up with a little additional ginger and cayenne. For immediate use, the skins should be put into a wide-mouthed bottle with a little of the different ingredients, and they will be found very nice for hashes or stews. Time.—4 or 5 hours in a cool oven. Seasonable from the middle of September to the end of October.

Tomato Sauce for Keeping.—3 doz. tomatoes; to every pound of tomato pulp allow 1 pt. of chili vinegar, 1 oz. of garlic, 1 oz. of shalot, 2 oz. of salt, 1 large green capsicum, ½ teaspoonful of cayenne, 2 pickled gherkins, 6 pickled onions, 1 pt. of common vinegar, and the juice of 6 lemons. Choose the tomatoes when quite ripe and red; put them in a jar with a cover to it, and bake them till tender. The better way is to put them in the oven overnight, when it will not be too hot, and examine them in the morning to see if they are tender. Do not allow them to remain in the oven long enough to break them; but they should be sufficiently soft to skin nicely and rub through the sieve. Measure the pulp, and to each pound of pulp add the above proportion of vinegar and other ingredients, taking care to chop very fine the garlic, shalot, capsicum, onion, and gherkins. Boil the whole together till everything is tender; then again rub it through a sieve, and add the lemon juice. Now boil the whole again till it becomes as thick as cream, and keep continually stirring; bottle it when quite cold, cork it well, and seal the corks. If the flavor of garlic and shalot is very much disliked, diminish the quantities. Time.—Bake the tomatoes in a cool oven all night. Seasonable from the middle of September to the end of October. A quantity of liquor will flow from the tomatoes, which must be put through the sieve with the rest. Keep it well stirred while on the fire, and use a wooden spoon.

Tomato Chow-chow.—Take 6 large ripe tomatoes, 1 large onion, 1 green pepper, 1 tablespoonful of salt, 2 of brown sugar, 2 teacupfuls of vinegar. Peel and cut fine the tomatoes, chop fine the onion and pepper, add the salt, sugar, and vinegar. Stew gently for 1 hour. Make this in September.

Mustards.—French Mustard.—Mustard, whole mixed spice, 3 lumps of sugar, vinegar. Boil the spices and sugar in some of the vinegar; take some good mustard and mix it into a stiff paste with cold vinegar. With a red hot iron heater, or other suitable piece of iron, stir quickly while you mix in the boiling vinegar, after straining it from the spices; put into wide-mouthed bottles. Will keep for years if kept well corked. Seasonable at any time.

Note.—A substitute for French mustard may be had by making 2 qt. of vinegar hot and pouring it over 6 oz. of salt, ¼ lb. of scraped horseradish, ¼ oz. of sugar and half a clove of garlic. This should stand for twenty-four hours before it is strained and bottled.

Prepared Table Mustard.—1. Ordinary Mustard.—Stir gradually 1 pt. of good white wine into 8 oz. of ground mustard seed and a pinch of pulverized cloves, and let the whole boil over a moderate coal fire. Then add a small lump of white sugar, and let the mixture boil up once more.

2. Pour ½ pt. of boiling white vinegar over 8 oz. of ground mustard seed in an earthen pot, stir the mixture thoroughly, then add some cold vinegar, and let the pot stand overnight in a warm place. The next morning add ½ lb. of sugar, ¾ drm. of pulverized cinnamon, ½ drm. of pulverized cloves, 1¼ drm. of Jamaica pepper, some cardamom, nutmeg, half the rind of a lemon, and the necessary quantity of vinegar. The mustard is now ready, and is kept in pots tied up with bladder.

3. Mix 8 lb. of ground mustard seed with 1½ pt. of good, cold vinegar, heat the mixture over a moderate fire for 1 hour, add 1 drm. of

ground Jamaica pepper, and when cold keep it in well closed jars.

4. Frankfort Mustard.—Mix 1 lb. of white mustard seed, ground, a like quantity of brown mustard seed, 8 oz. of pulverized loaf sugar, 1 oz. of pulverized cloves, 2 oz. of allspice, and compound the mixture with white wine or wine vinegar.

5. Lenormand's Mustard.—Mix with 2 lb. of ground mustard seed, ¼ oz. each of fresh parsley and tarragon, both cut up fine, 1 clove of garlic also cut up very fine, and 12 salted anchovies; *grind the* mixture very fine, add the required mustard and 1 oz. of pulverized salt, and for further grinding dilute with water. To evaporate the water after grinding the mustard, heat an iron rod red hot, and cool it off in the mixture, and then add wine vinegar of the best quality.

6. Very Fine Table Mustard.—Digest 1¾ oz. of fresh tarragon leaves, 2 bay leaves, 1 lemon (juice and rind), ¼ drm. each of cloves and cinnamon, ¾ drm. of black pepper, ¾ oz. of dill, and 1 onion in ½ gal. of good vinegar. It is best to use a steam apparatus for the purpose. Then strain the fluid into a porcelain vessel, and, while it is yet warm, mix with it 1 lb. of ground black mustard seed, a like quantity of white mustard, 1 lb. of sugar and 3½ oz. of common salt. Let the whole digest, stirring frequently, until the mustard has lost some of its sharpness by the evaporation of the ethereal oil, and then dilute, according to *taste*, with more or less vinegar.

7. Fresh Mustard.—The following mixture is to be mixed with good wine vinegar, or, better yet, a vinegar in which have been macerated some celery root, garlic, onion and chives: Colman's mustard, 900 parts; sugar, 100 parts; salt, 100 parts; pepper, 50 parts; cinnamon, 25 parts; cardamom, 10 parts; and ginger, 15 parts.

A Good Mustard (Soyer).—Mustard seed, 1 part, weak wood vinegar, 2 parts. Pour the vinegar on the mustard seed and let them soak for a fortnight; then grind the whole into a paste in a mill and put it into pots, then thrust a red-hot poker into each of the pots. Seasonable at any time.

Indian Mustard.—¼ lb. of best mustard, ¼ lb. of flour, ½ oz. of salt, 4 shalots, 4 tablespoonfuls of vinegar, 4 tablespoonfuls of catsup, ¼ bottle of anchovy sauce. Put the mustard, flour, and salt into a basin, and make them into a stiff paste with boiling water. Boil the shalots with the vinegar, catsup, and anchovy sauce, for 10 minutes, and pour the whole, boiling, over the mixture in the basin; stir well, and reduce it to proper thickness; put it into a bottle, with a bruised shalot at the bottom, and store away for use. This makes an excellent relish, and if properly prepared will keep for years.

Ravigotte Mustard.—Parsley, 2 parts; chervil, 2 parts; chives, 2 parts; cloves, 1 part; garlic, 1 part; thyme, 1 part; tarragon, 1 part; salt, 8 parts; olive oil, 4 parts; white wine vinegar, 128 parts; mustard flour, sufficient.

Cut or bruise the plants and spices, and macerate them in the vinegar for fifteen or twenty days. Strain the liquid through a cloth and add the salt. Rub up mustard with the olive oil in a vessel set in ice, adding a little of the spiced vinegar from time to time until the whole is incorporated and the complete mixture makes 384 parts.

Catsups.—Camp Catsup.—2 qt. of strong old beer, 1 qt. of white wine, ¼ lb. of anchovies, 3 oz. of peeled shalots, ½ oz. of grated nutmeg, ditto mace, ditto sliced ginger. Put the ingredients on the fire in a saucepan, and stir them till they are reduced one-third. Bottle next day with the spice and shalots. About 1½ hours.

Grape Catsup.—5 lb. of ripe grapes, 2½ lb. of sugar, 1 pt. of vinegar, 1 teaspoonful each of cinnamon, cloves, allspice, and pepper, ½ teaspoonful of salt. Boil the grapes in enough water to prevent burning, strain through a colander, add the other ingredients, and boil until a little thickened. Bottle, and cork and seal. Make this from August to October.

Mustapha or Liver Catsup.—1 beef liver, 1 gal. of water, 1 oz. of ginger, 1 oz. of allspice, 2 oz. of whole black pepper, 2 lb. of salt. Roll the salt, and well rub it into a very fresh beef liver, and place it in a vessel that will not crush it. Turn and rub it thoroughly for 10 days. Then mince it into small dice, and boil in a gallon of water, closely covered, until reduced to 3 qt. Then strain through a sieve, and let it settle till next day. Add the pepper, allspice, and ginger, and boil slowly until further reduced to 3 pt. When cold, bottle and keep well corked. Time.—12 days. Seasonable at any time.

Mushroom Catsup.—To each peck of mushrooms ½ lb. of salt; to each quart of mushroom liquor ¼ oz. of cayenne, ½ oz. of allspice, ½ oz. of ginger, 2 *blades* of pounded mace. Choose full grown mushroom-flaps, and take care they are perfectly fresh gathered when the weather is tolerably dry; for, if they are picked during very heavy rain, the catsup from which they are made is liable to get musty and will not keep long. Put a layer of them in a deep pan, sprinkle salt over them, and then another layer of mushrooms, and so on alternately. Let them remain for a few hours, when break them up; put them in a nice cool place for three days, occasionally stirring and mashing them well, to extract from them as much juice as possible. *Now* measure the quantity of liquor without straining, and to each quart allow the above proportion of spices, etc. Put all into a stone jar, cover it up very closely, put it in a saucepan of boiling water, set it over the fire, and let it boil for three hours. Have ready a nice clean stewpan; turn into it the contents of the jar, and let the whole simmer very gently for half an hour; pour it into a jug, where it should stand in a cool place till the next day; then pour it off into another jug, and strain it into very dry clean bottles, and do not squeeze the mushrooms. To each pint of catsup add a few drops of brandy. Be careful not to shake the contents, but leave all the sediment behind in the jug; cork well, and either seal or rosin the cork, so as perfectly to exclude the air. When a very clear, bright catsup is wanted, the liquor must be strained through a very fine hair-sieve or flannel bag, after it has been very gently poured off; if the operation is not successful, it must be repeated until you have quite a clear liquor. It should be examined occasionally, and if it is spoiling, should be reboiled with a few peppercorns. Seasonable from the beginning of September to the middle of October, when this catsup should be made.

Oyster Catsup.—Sufficient oysters to fill a pint measure, 1 pt. of sherry, 3 oz. of salt, 1 drm. of cayenne, 2 drm. of pounded mace. Procure the oysters very fresh, and open sufficient to fill a pint measure; save the liquor, and scald the oysters in it with the sherry; strain the oysters, and put them in a mortar with the salt, cayenne and mace; pound the whole until reduced to a pulp, then add it to the liquor in which they were scalded; boil it again five minutes, and skim well; rub the whole through a sieve, and, when cold, bottle and cork closely. The corks should be sealed. Seasonable from September to April. Cider may be substituted for the sherry.

Pontac Catsup or Sauce.—Ripe elderberries, vinegar, cloves, mace, peppercorns, shalots, anchovies. Take ripe elderberries, as many as you wish to store, pick them from their stalks into a stone jar and just cover with strong, good vinegar. Bake in a hot oven for three hours, then strain while hot. Boil the liquor thus obtained with the spices and shalots, sufficient being put in to give a considerable flavor. Taste the mixture, and, when found sufficiently flavored, put half a pound of the best anchovies

to every quart of the liquor; then stir and boil till these are dissolved, and move at once from the fire. Put up in pint bottles, cork closely and tie bladders over the top. Time: From 3 to 4 hours. Prepare this in September.

Tomato Catsup.—Spices of various kinds are employed for this purpose, as the following formula shows:

1. Ripe tomatoes..... .....6 qt.

Bruise and set in an oven with 1½ lb. of salt and a quart of water. At the end of an hour pour off a gallon of juice, and to this add shalots, peeled and sliced, 4 oz., black pepper, bruised, ½ oz.; mace, bruised, ½ oz.; pimento, bruised, ½ oz.; ginger, bruised, ½ oz.; nutmeg, bruised, ½ oz.; cochineal, in coarse powder, 2 drm.; cayenne pepper, in coarse powder, 1 drm.; brown vinegar, 1 pt. Simmer gently for half an hour, strain and bottle.

2. Ripe tomatoes, 3 doz.; chili vinegar, 1 pt.; garlic, 1 oz.; shalots, 1 oz.; common salt, 2 oz.; cayenne pepper, ½ drm.; lemon juice, 5 oz. Put the tomatoes into a jar and warm in an oven until tender. Cool, skin, and pulp the fruit, and add to the liquor in the jar, along with the rest of the ingredients. Mix well and bottle.

Walnut Catsup.—Half sieve of walnut shells, 2 qt. of water, salt, ½ lb. of shalots, 1 oz. of cloves, 1 oz. of mace, 1 oz. of whole pepper, 1 oz. garlic. Put the walnut shells into a pan, with the water and a large quantity of salt; let them stand for 10 days, then break the shells up in the water, and let it drain through a sieve, putting a heavy weight on the top to express the juice; place it on the fire, and remove all scum that may arise. Now boil the liquor with the shalots, cloves, mace, pepper and garlic, and let all simmer till the shalots sink; then put the liquor into a pan, and, when cold, bottle and cork closely. It should stand 6 months before using; should it ferment during that time, it must be again boiled and skimmed. Time: About ¾ hour. Seasonable in September, when the walnut shells are obtainable.

Vinegar.—Camp Vinegar.—1 head of garlic, ½ oz. of cayenne, 2 teaspoonfuls of soy, 2 teaspoonfuls of walnut catsup, 1 pt. of vinegar, cochineal to color. Slice the garlic, and put it, with all the above ingredients, into a clean bottle. Let it stand to infuse for a month, then strain it off quite clear, and it will be fit for use. Keep it in small bottles, well sealed to exclude the air.

Cress Vinegar.—½ oz. of cress seed, 1 qt. of vinegar. Bruise the seed in a mortar, and put it into the vinegar, previously boiled and allowed to grow cold. Let it infuse for a fortnight, then strain and bottle for use.

Cucumber Vinegar.—10 large cucumbers, or 12 smaller ones, 1 qt. of vinegar, 2 onions, 2 shalots, 1 tablespoonful of salt, 2 tablespoonfuls of pepper, ¼ teaspoonful of cayenne. Pare and slice the cucumbers, put them into a stone jar or wide-mouthed bottle with the vinegar; slice the onions and shalots, and add them, with all the other ingredients, to the cucumbers. Let it stand 4 or 5 days, boil it all up, and, when cold, strain the liquor through a piece of muslin, and store it away in small bottles well sealed. This vinegar is a very nice addition to gravies, hashes, etc., as well as a great improvement to salads; or to eat with cold meat.

Garlic Vinegar.—2 oz. of garlic, 1 qt. of wine vinegar. Chop the garlic finely and weigh it, then put it in the above proportion to the cold boiled vinegar. Infuse for a fortnight, strain and bottle.

Horseradish Vinegar.—¼ lb. of scraped horseradish, 1 oz. of minced shalot, 1 drm. of cayenne, 1 qt. of vinegar. Put all the ingredients into a bottle, which shake well every day for a fortnight. When it is thoroughly steeped, strain and bottle, and it will be fit for use immediately. This will be found an agreeable relish to cold beef, etc. This vinegar should be made either in October or November, as horseradish is then in its highest perfection.

Mint Vinegar.—Vinegar, mint. Procure some nice fresh mint, pick the leaves from the stalks, and fill a bottle or jar with them. Add vinegar to them until the bottle is full, cover closely to exclude the air, and let it infuse for a fortnight. Then strain the liquor, and put it into small bottles for use, of which the corks should be sealed. This should be made in June, July or August.

Shalot Vinegar.—2 oz. of shalots, 1 qt. of wine vinegar. Prepare precisely as directed for garlic vinegar. Make this in October.

Indian Curry Powder.—¼ lb. of coriander seed, ¼ lb. of turmeric, 2 oz. of cinnamon seed, ½ oz. of cayenne, 1 oz. of mustard, 1 oz. of ground ginger, ½ oz. of allspice, 2 oz. of fenugreek seed. Put all the ingredients in a cool oven, where they should remain one night; then pound them in a mortar, rub them through a sieve, and mix thoroughly together; keep the powder in a bottle, from which the air should be completely excluded.

To Dry Herbs for Winter Use.—On a very dry day gather the herbs, just before they begin to flower. If this is done when the weather is damp, the herbs will not be so good a color. (It is very necessary to be particular in little matters like this, for trifles constitute perfection, and herbs nicely dried will be found very acceptable when frost and snow are on the ground. It is hardly necessary, however, to state that the flavor and fragrance of fresh herbs are incomparably finer.) They should be perfectly freed from dirt and dust and be divided into small bunches, with their roots cut off. Dry them quickly in a very hot oven, or before the fire, as by this means most of their flavor will be preserved; be careful not to burn them; tie them up in paper bags, and keep in a dry place. This is a very general way of preserving dried herbs; but we would recommend the plan described in the next recipe. From the month of July to the end of September is the proper time for storing herbs for winter use.

Herb Powder for Flavoring.—1 oz. of dried lemon-thyme, 1 oz. of dried winter savory, 1 oz. of dried sweet marjoram and basil, 2 oz. of dried parsley, 1 oz. of dried lemon peel. Prepare and dry the herbs by recipe above; pick the leaves from the stalks, pound them, and sift them through a hair-sieve; mix in the above proportions, and keep in glass bottles, carefully excluding the air. This we think a far better method of keeping herbs, as the flavor and fragrance do not evaporate so much as when they are merely put in paper bags. Preparing them in this way, you have them ready for use at a moment's notice. Mint, sage, parsley, etc., dried, pounded, and each put into separate bottles, will be found very useful in winter.

Mushroom Powder.—½ peck of large mushrooms, 2 onions, 12 cloves, ¼ oz. of pounded mace, 2 teaspoonfuls of white pepper. Peel the mushrooms, wipe them perfectly free from grit and dirt, remove the black fur, and reject all those that are at all worm-eaten; put them into a stewpan with the above ingredients, but without water; shake them over a clear fire till all the liquor is dried up, and be careful not to let them burn; arrange them on tins and then dry them in a slow oven; pound them to a fine powder, which put into small, dry bottles; cork well, seal the corks, and keep it in a dry place. In using this powder, add it to the gravy just before serving, when it will merely require one boil-up. The flavor imparted by this means to the gravy ought to be exceedingly good. This should be made in September or at the beginning of October.

Note.—If the bottles in which it is stored away are not perfectly dry, as also the mush-

room powder, it will keep good but a very short time.

Plant Colors, Preserving.—A. F. Woods describes a method of preserving the green color of plants for exhibition purposes which appears to be similar in principle to the coppering of green peas. Air is removed as completely as possible from the surface and intercellular spaces of the plants by immersion in 90 to 95 per cent. alcohol, or an air-pump may be employed. The plants are next immersed in dilute glycerine (5 per cent.) to which a bluish tint has been imparted by means of copper sulphate or acetate. The copper combines with the chlorophyl, forming copper phyllocyanate, which is practically insoluble in any ordinary preservative medium except strong alcohol, and is not affected by light. Any excess of copper salt may be dissolved out by a mixture of dilute glycerine and formalin, which may also be employed with advantage as the preservative medium.—*Botanical Gazette.*

Plaster of Paris.—*Making Lubricant for Plaster Moulds.*—The mixtures, greases and oils usually employed for this purpose have the disadvantage of being sticky or of easily attracting dust. According to Puscher, this drawback is avoided if stearic acid is used instead. Melt one part stearic acid in a glass by immersing the same in boiling water and add four to five parts alcohol (95 per cent.). Agitate the clear solution until cold, whereby a thin paste of very finely distributed stearic acid is formed, with which the moulds are coated by means of a painting brush. The spirit evaporates at once and leaves a very thin layer of stearic acid, which admits of readily freeing the cast from the mould.

Making Plaster Casts of Carved Articles.—If the objects are cut conically, they are simply pressed into a lump of soft clay; then paint the mould thus produced with linseed oil, and pour in the plaster of Paris. For complicated objects such as animal heads, deepened reliefs, etc., glue moulds are employed. Prepare a box just large enough to receive the model. Boil good joiner's glue in sufficient quantity, and after the model (which has been thoroughly coated with shellac, and after this is dry with linseed oil) has been laid in the box, pour the liquid glue into the box. After a few hours the glue is sufficiently dry so that the model can be taken out. Now coat the glue mould all over with linseed oil and pour in the gypsum. In this manner very good impressions are obtained at a comparatively slight expense. The moulding glue can be used over again at any time.

To Produce Stuccoed Flowers from Plaster of Paris.—Take natural flowers and coat the lower side of their petals and stamens with paraffine or with a mixture of glue, gypsum and lime, which is applied lightly. Very fine parts of the flower, such as stamens, etc., may be previously supported by special attachments of textures, wire, etc. After the drying of the coating, the whole is covered with shellac solution or with a mixture of glue, gypsum, lime with lead acetate, oil, mucilage, glycerine, colophony, etc. If desired, the surface may now be painted with bronzes in various shades. Such flowers are now much employed in the form of festoons for decorating walls, ceilings, lusters, etc., and are very handsome.—*Der Dekorationsmaler.*

Hardening Plaster of Paris.—Plaster of Paris may be caused to set more quickly if some alum be dissolved in the water used for rendering it plastic. If the gypsum is first moistened with a solution of alum and then again burned, the resulting compound sets very quickly and becomes as hard as marble. Borax may be similarly employed. In 1877 the Prussian government awarded three prizes for inventions submitted at its invitation of processes for hardening plaster of Paris casts. The principle of all these consist in this, that the objects are to be treated with a solution of caustic baryta. But it has been found that no matter how deep this penetrates, the baryta is again drawn toward the surface when the water evaporates, a portion efflorescing on the outside, and only a thin layer remaining in the outer shell, where it is converted into carbonate. This at the same time stops up the pores, rendering it impossible to repeat the operation. It was later found that the whole mass of the cast might be hardened by applying to it with a brush made of glass bristles, a hot solution of baryta. To prevent separation of the crystallized baryta at the surface, the object must be raised to a temperature of 60° to 80° C. To produce good results, however, it is necessary to add to the plaster before casting certain substances with which the baryta can combine. These are silicic acid in some form, or the sulphates of zinc, magnesium, copper, iron, aluminum, etc. With some of these the resulting object may be colored. As it is, however, difficult to insure the production of uniform tint, it is better when employing salts producing color, to mix the plaster with about five per cent. of quick lime, or, better, to render it plastic with milk of lime, and then to soak the object in a solution of metallic sulphate.

The Techno-Chemical Receipt Book gives the following directions for Brethauer's method of preparing plaster of Paris casts for resisting the action of the weather. Slake one part of finely pulverized lime to a paste, then mix gypsum with lime water and intimately mix both. From the compound thus prepared the figures are cast. When perfectly dry they are painted with hot linseed oil, repeating the operation several times, then with linseed oil varnish, and finally with white oil paint. Statues, etc., prepared in this way have been constantly exposed to the action of the weather for four years without suffering any change.

Jacobsen prepares casts which retain no dust, and can be washed with lukewarm soap water by immersing them or throwing upon them in a fine spray a hot solution of a soap prepared from stearic acid and soda lye in ten times its quantity by weight of hot water.

Shellhass recommends the coating of plaster of Paris casts with a compound of finely powdered mica and collodion prepared as follows: the mica rendered perfectly white by boiling with hydrochloric acid or calcining, is ground very fine, sifted and elutriated, and then mixed with dilute collodion to the consistency of oil paint, and applied with a soft brush. Casts coated in this way possess a silvery luster, have the advantage of being indifferent to sulphurous exhalations, and can be washed without injury.—*Pharmaceutical Era.*

To Marble Plastic Figures.—Dissolve an ounce of pure curd soap, grated in water, and add one ounce of white wax, cut in thin slices. When the whole is incorporated it is fit for use. Having dried the figure before the fire, suspend it by a string and dip it in the mixture: when it has absorbed the varnish, dip it in a second time, and that generally suffices; cover it carefully from the dust for a week, then rub it gently with soft cotton wool, and you will have a bril-

liant shining gloss, resembling polished marble.

Transparent Casts.—Beautiful semi-transparent casts of fancy articles may be taken in a compound of 2 parts unbaked gypsum, 1 of bleached beeswax, and 1 of paraffin. This becomes plastic at 120° F., and is quite tough.

To Retard the Setting of Plaster of Paris.—When, for some reason, in making plaster casts or bandages, it becomes desirable to retard the setting of the plaster magma, this may be accomplished by adding to the water powdered althæa root in the proportion of two to four per cent. When dry, such casts may be sawed, filed and turned. An addition of eight per cent. of althæa retards setting for a full hour, and the mass may be kneaded, rolled, and otherwise shaped. The addition of a very little alum or ferric chloride produces a very hard cast. Good plaster should not set in less than three minutes.—*Western Druggist.*

Washable Plaster Casts.—Coating or saturating the cast with a neutral soap from stearic acid and soda lye dissolved in ten times the quantity of hot water is recommended. Cleaning of dust may be done with lukewarm water. Of special merit, however, is the following process: Leave the plaster of Paris casts after complete drying for twenty-four hours in a cold barytes solution, wash them off carefully with cold water after removal, so as to eliminate the adhering barytes and allow them to dry three to four days at an ordinary room temperature. Next put them for a short time (about one-half hour) in a hot solution of one part grain soap in fifteen to twenty parts water, and dry them finally, after the adhering soap particles have been removed with water, in suitable drying rooms.—*Deutsche Maler Zeitung.*

Hardened and Washable Articles of Plaster of Paris.—For the hardening of gypsum a firm in Heidelberg has taken out a German patent on a process which apparently surpasses all those in existence and furnishes very satisfactory results. Either burnt gypsum is prepared and mixed with the liquid named below or else the finished articles of hot gypsum or of mixtures of gypsum and other bodies are impregnated by painting with the fluid. The same consists of a solution of ammonium triborate in water. For this purpose boracic acid is dissolved in warm water and a certain amount of ammonia is added, whereby a substance readily soluble in water and deviating much in its properties from known compounds results. The saturation of the gypsum or painting of the plaster of Paris articles is carried out in the cold. The objects are subsequently rinsed off and dried. The surface becomes very hard after two days and insoluble in water, while the induration in the interior advances more slowly. By means of the fluid described gypsum floors can be hardened and rendered more durable and impervious to the influence of the weather. Saturating with ammonium borate is said to be especially useful on exterior walls of buildings, barracks, etc.: on the latter, because experiments have proved an antiseptic action of the liquid.

Plaster Casting.—(1) The model (of clay or otherwise) is first covered with a layer of good plaster of Paris, mixed, or "gauged," as plasterers call it, to the consistency of batter, and colored with a little red or yellow ocher. This layer should average about ¼ in. thick. It is best applied with the pewter or metal spoon used to mix the plaster with. The plaster is mixed in a basin half full of water, into which it is sprinkled by the hand, as oatmeal is sprinkled in making stirabout; when the plaster reaches the surface of the water, it is about sufficient, but experience soon teaches the right proportion. The mixed plaster can be jerked by a dexterous twist of the spoon into the deep undercut places, and care must be taken not to inclose bubbles of air. A practical moulder would place the clay slab in a vertical position, as he would see the process of his work better. A large model would require several mixings of plaster, as when the plaster begins to set or harden, it is useless for moulding. When the first colored coat of plaster is hardened, a wash of clay water should be applied nearly all over it, and the second coating, which may be of coarser stuff, put on to the thickness of about 1 in. If the mould is very large, some strips of iron nail rod, ¼ in. square, may be embedded in the back of the mould to prevent warping. When the mould is set hard, it must be turned over, and the clay picked out. If the work has been modeled on a board or slate, or best of all, on a plaster slab, it may be necessary to pass a wire between the clay and the board to separate them. When the mould has been well cleaned and washed with a soft brush, it should be soaked in a tub of water until quite saturated through and through, drained, but not wiped, and a sufficient quantity of superfine plaster, carefully mixed, poured into it, and, by moving the mould about, carefully distributed all over. This may be backed with coarser plaster, and strengthened with iron rods, which in this case should be painted or coated with a varnish of rosin and tallow. When the cast is set hard, the most difficult part, called "knocking out," begins. A light mallet and a carpenter's firmer chisel, by a few dexterous strokes applied upon the edge, will separate the coarse outer backing of the mould, prevented by the wash of clay water from adhering to the first colored layer. The cast should then be placed upon a soft elastic bed—an empty sack folded is as good as any—and by gentle taps, holding the chisel perpendicularly, or nearly so, to the face of the work, the colored plaster may be snapped off, sometimes in large, sometimes in minute pieces, the color preventing the operator chipping away the best part of his work, which may happen when mould and cast are of one color. A chisel 1 in. or more broad may be used for the first rough work; smaller will be required for delicate parts.

A figure in the round may be moulded by the same process, but the mould must be in two parts. A strip of clay 1 in. or so wide must be fixed all around the clay figure, to be removed when the first half of the mould is done. The edge of the first half must have sunk holes, made by any convenient steel modeling tool, to insure the fitting of the two halves in the mould. Projecting limbs must be cut off with a fine wire, and cast separately. If an iron support enters the back of the model, a little clay must be put round it, close to the model, to enable the iron to be drawn through the mould, and the hole in the mould stopped up with plaster. The two parts, carefully saturated and bound together, may be about half-filled with well mixed superfine plaster, as thick as cream, which, by carefully turning and inclining the mould, can be made to cover the whole of the mould, leaving a large hollow to be filled with a coarser plaster, in which a painted iron rod may be inserted. Good plaster smells sweet, sets in 10-20 minutes as hard and as crisp as loaf sugar. Bad plaster smells of sulphur,

and never sets hard. Beginners must make sure of their materials, and even then should try their hands on unimportant work.

Small reliefs may be moulded in wax. A border of clay or strips of wood a little higher than the highest part of the model must be fixed all round, and melted beeswax with a little rosin and tallow added, poured over the clay. When the wax is cold, and the clay well washed out, superfine plaster can be poured in as into a plaster mould. The wax is afterward melted off or softened before a fire and peeled off, to serve again as often as you please.

Poisoning, Remedy for Ivy.—Dr. James J. Levick, of Philadelphia, writes to *The Medical News*: "In a case of poisoning of the hands from Rhus toxicodendron—poison oak—recently under my care, which had reached the vesicular stage and was attended with much swelling and burning, the happiest results promptly followed the free dusting of the powder of aristol on the affected parts. The change was almost magical, so sudden and so prompt was the relief afforded.

Polish, Laundry. See **Laundry Polish.**

Polish, Stove. See **Blackings, Stove.**

Polishing.—*Floor Polish.*—

Potash	1 part.
Water	4 parts.
Yellow beeswax	5 parts.
Hot water, a sufficient quantity.	

Emulsify the wax by boiling it in the water in which the potash has been dissolved; stir the whole time. The exact amount of boiling is determined by the absence of any free water in the mass. Then remove the vessel from the fire, and gently pour in a little boiling water, and stir the mixture carefully. If a fat-like mass appears without traces of watery particles, one may know the mass is in a fit condition to be liquefied by the addition of more hot water without the water separating. Then put in the water to the extent of 200 to 225 parts, and re-heat the compound for five to ten minutes, without allowing it to reach the boiling point. Stir constantly until the mixture is cool, so as to prevent the separation of the wax, when a cream-like mass results, which gives a quick and brilliant polish on woodwork, if applied in the usual way, on a piece of flannel rag, and polished by rubbing with another piece of flannel.—*Druggists' Circular.*

Ivory, to Polish, in the Lathe.—Ivory and fine hard woods may be polished in a turning lathe by mixing with tripoli the dust and shavings that turn off, and pressing it against the work while turning.

Leather Polish.

1. Sandarac	¼	oz.
Shellac	1	oz.
Glycerin	1½	drm.
Castor oil	2	drm.
Oil of mirbane	½	drm.
Anilin blue	10	grn.
Anilin black	1	drm.
Alcohol	8	oz.

Wood alcohol, being cheaper than the grain spirit, might be used, or a mixture of the two would answer.

2. Resin	2	drm.
Gum thus	2	drm.
Turpentine	2	drm.
Sandarac	4	drm.
Shellac	1	oz.
Alcohol	7½	oz.
Lampblack	1	drm.

Dissolve all but the pigment in the alcohol, filter, and add the lampblack. Instead of lampblack, zinc white, ultramarine blue, or other similar coloring may be used. This is said to be elastic and unbreakable.—*Druggists' Circular.*

Liquid Polish for Metals.—

Peroxide of iron (jewelers' rouge)	20 parts.
Rotten stone	20 parts.
Infusorial earth	20 parts.
Oxalic acid	1 part.
Palm oil sufficient.	
Vaseline sufficient.	
Oil of mirbane sufficient to perfume.	

Pulverize and mix, so proportioning the palm oil and vaseline that you have a liquid sufficiently "thick" to hold the powders in suspension. We would remind you that the preparation of polishes, simple as it seems, is an art, and, like every other, requires a certain amount of practical experience, as well as a knowledge of the materials entering into the composition of the polishing mixture used, and of their preparation for use. To attain a high and uniform grade of polish, the materials must be reduced to a very fine and uniform powder. One single grain of the material larger or sharper than the rest will produce scratches that interfere with the finish given the metal. To make sure of your jewelers' rouge being free from dust and grit, prepare it fresh, as follows: Make a solution of iron sulphate (copperas), and another of oxalic acid. Add the latter to the former, as long as it throws down a precipitate. Filter off the liquid, and wash the residue on the filter with repeated charges of water, and dry. When dry, place in a suitable container, and heat gently. It soon ignites and burns until only an impalpable powder is left. This is the polishing material. The infusorial earth must be freed from sand, grit, etc., and reduced by grinding to a condition similar to that of the iron peroxide. The rotten stone and acid must also be powdered. If care and attention be given to these details, you can scarcely fail to get good results.

Metal Polish.—For general use in polishing metals, prepared chalk is a good substance; rotten stone, tripoli, and emery are also commonly used agents. For the finest work, jewelers' rouge is employed. This is prepared by calcining precipitated ferric oxide until it assumes a scarlet color.

Substances like emery are most useful for the harder metals, as they scratch too much to be used to any extent on gold or silver. All should be run through a fine sieve before being used.

These various substances, used for polishing metals, are made into pastes, when that form is desired, by being mixed with oleic acid, lard oil, or other fatty vehicle. If the grease should in any case prove objectionable, it is quite probable that glycerin could be substituted for it with satisfactory results.

There have been many formulas published for producing polishing "pomades" for use on metal. It is said that a well-known article, sold as "putz pomade," consists of Armenian bole, with sufficient oleic acid to form a paste, and oil of bitter almond to impart an odor. The term "putz," it may be explained, is from putzen, the German for "cleaning" or "polishing."

"Putz tablets" may be made by this recipe:

Soap, cut fine	16 parts.
Precipitated chalk	2 parts.
Jewelers' rouge	1 part.
Cream of tartar	1 part.
Magnesium carbonate	1 part.
Water, a sufficient quantity.	

Dissolve the soap in the smallest quantity of water, over a water bath. Add the other ingredients to the solution while still hot, stirring all the time to make sure of complete homogeneity. Pour the mass into a box with shallow sides, and afterward cut into cubes.

Polishing pastes may also be made as follows:

1. Rotten stone .... 1 part.
   Iron subcarbonate..... 3 parts.
   Lard oil, a sufficient quantity.
2. Iron oxide..... ...10 parts.
   Pumice stone..... .....32 parts.
   Oleic acid, a sufficient quantity.

Sometimes it is desirable to have a liquid polish for metals. Properly speaking, there can be no such thing, as the polishing process depends, as we have already pointed out, on the attrition of fine particles of some substance a little harder than the metal. The powders used can be, and frequently are, employed in a moist condition, and they may be suspended in water by shaking. A mixture of whiting and ammonia water is frequently used in cleaning metals, the ammonia acting as a solvent of some kinds of dirt. It is best, however, to remove grease, etc., before beginning the polishing process, and the effects of strong alkalies on the hands are not pleasant. The following may be taken as a working formula for a polish of this type:

Prepared chalk..... 2 parts.
Water of ammonia..... 2 parts.
Water, sufficient to make..... 8 parts.
To be well shaken before using.

It is true that the acids, by their chemical action, remove rust and dirt from metallic surfaces without the aid of any of these hard, fine powders, but they generally remove also a portion of the metals themselves each time they are applied. A weak solution in water of any of the strong mineral acids, or even of citric or oxalic acid, might be found useful in a number of instances, but could not be recommended for general use.—*Druggists' Circular.*

Metal Polishes, Pastes, Liquids, Powders, Soaps, Etc.—At one time we had to get along with only a few makes of metal pastes; these were nearly always red in color, the exceptions being black, says *Oils, Colours and Drysalteries.* During the past few years more than a score of new brands have appeared.

Red Polishing Paste (without acid).—A. C. peroxide (sesquioxide of iron), 40 lb.; Venetian red (dry), 36 lb.; palm oil, 20 lb.; petroleum jelly, 20 lb.; mineral lubricating oil, ½ gal.; mirbane oil, 4 oz.

Melt the palm oil, mineral oil, and jelly; stir in the peroxide and red, add scent, then grind. Some pastes are not ground but simply mixed together, causing them to sweat when tinned; moreover, they do not look so well as those put through the mill.

The next mixture contains acid and makes a German style of paste. The color is red or chocolate:

Red Polishing Paste (acid).—Rotten stone, 30 lb.; bathbrick powder, 28 lb.; red ocher, 26 lb.; emery flour, 14 lb.; crocus martis, 14 lb.; oxalic acid, 10½ lb.; petroleum jelly, 50 lb.; mineral oil, 1¼ gal.; citronella oil, 6 oz.

Powder the oxalic acid and mix with the earthy matters by running through sieves, then grind up with the greases. Some bases absorb more oil than others, and if the paste is rather stiff add more oil or jelly. The correct consistence for metal paste should be that of butter in winter. If softer, it will ooze out during the hot weather, but will not become so soft as butter does, as the earthy matters keep in the grease to a large extent.

Another paste is one of a

Buff Color.—Petroleum jelly, 42 lb.; refined paraffine wax, 14 lb.; powdered bathbrick, 14 lb.; powdered pipeclay, 14 lb.; powdered pumice, 2 lb.; yellow ocher, 2 lb.; oleic acid, 1 lb.; oil cassia, 3 oz.

Melt the wax and jelly, stir in the others, and grind as before.

Another polisher is known as

Jeweler's Polishing Bar.—Refined tallow, 80 lb.; sesquioxide iron, 16 lb.; oxalic acid, 1 lb.

Powder the acid, mix with sesquioxide, and mould with the tallow into bars like soap. The sesquioxide must be quite free from grit, or it may scratch valuable work. It may be prepared by calcining equal amounts of oxalic acid and iron sulphate in a crucible for about fifteen minutes with a good draught.

The next is a

White Polishing Paste.—Tallow, 36 lb.; white mineral jelly, 20 lb.; non-gritty chalk, 30 lb.; levigated flint, 4 lb.; powdered pumice, 3 lb.; oxalic acid, 2½ lb.

Melt the tallow and jelly, powder the acid, mix well with the pumice, flint, and chalk, mix all and grind.

White Polishing Paste.—White petroleum jelly, 90 lb.; kieselguhr, 30 lb.; refined paraffine wax, 10 lb.; refined chalk or whiting, 10 lb.; soda hyposulphite, 8 lb.

Melt wax and jelly, stir in others and grind.

It is an undecided point as to whether a scented paste is better than one without perfume. The latter is added merely to hide the bad odor of some of the greases used, and it is not very nice to have spoons, etc., smelling, even tasting, of mirbane, so perhaps citronelle is best for this purpose. It is likely to be more pure. The amount of scent is usually at the rate of four ounces to the hundredweight.

A new form of polisher is put up in cylindrical card-board "push-up" cases, like cosmetique. These tubes are quite inexpensive, and they would have only to be filled with the composition and labeled, when they would be ready for sale.

Tube Polish.—Tallow, 10 lb.; lard, 10 lb.; Japan wax, 10 lb.; iron oxide, 8 lb.; soda hyposulphite, 1 lb.

Melt the first three, and stir in the other two, mixed together beforehand. This is of a red color.

Polishing Powder (1).—Kieselguhr, 42 lb.; putty powder, 14 lb.; pipeclay, 14 lb.; tartaric acid, 1½ lb.

Powder the acid, mix well with the others. This is styled "free from mercury, poisonous mineral acids, alkalies, or grit." It may be tinted with 12 ounces of oxide of iron if desired.

2. Kieselguhr, 28 lb.; powdered pipeclay, 10½ lb.; flake white, 7 lb.; soda hyposulphite, 3 lb.; iron oxide, 2 lb.

Finely powder and mix well.

Liquid Polish (1).—Malt vinegar, 4 gal.; lemon juice, 1 gal.; paraffine oil, 1 gal.; kieselguhr, 7 lb.; powdered bathbrick, 3 lb.; oil lemon, 2 oz.

Well mix.

2. Kieselguhr, 56 lb.; paraffine oil, 3 gal.; methylated spirit, 1½ gal.; camphorated spirit, ½ gal.; turpentine oil, ½ gal.; liquid ammonia fort, 3 pt.

Pour the ammonia into the oil, methylated spirits, and turpentine, add the camphorated spirit and mix with the kieselguhr. To prevent setting, keep well agitated during filling. The color may be turned red by using a little sesquioxide of iron and less kieselguhr. Apply with a cloth, and when dry use another clean cloth or a brush.

Polishing Soaps (1).—Powdered pipeclay, 112 lb.; tallow soap, 16 lb.; tartaric acid, 1¼ lb.

Grind until pasty, afterward press into blocks by the machine.

2. Levigated flint, 60 lb.; whiting, 52 lb.;

tallow, 20 lb.; caustic soda, 5 lb.; water, 2 gal.

Dissolve the soda in water and add to the tallow; when saponified, stir in the others, pressing as before.

3. Saponified cocoanut oil, 56 lb.; kieselguhr, 12 lb.; alum, 5½ lb.; flake white, 5½ lb.; tartaric acid, 1¾ lb.

Make as before.

4. Tallow soap, 98 lb.; liquid glycerine soap, 14 lb.; whiting, 18 lb.; levigated flint, 14 lb.; powdered pipeclay, 14 lb.

The following compound should be made into tablets instead of the usual bars:

Pink Tablets.—XX pale soap, 112 lb.; powdered pipeclay, 40 lb.; soda hyposulphite, 6 lb.; rose pink, 4 lb.

Grind and press as before. Another way of coloring is to add a little peroxide of iron, or make a solution of aniline in water. The rose pink should be pure wood color; if the color has been given to it by anilines, these may fade or change.

Polishing Cloths.—We will complete this article with a word upon polishing cloths, which are undyed velveteen in the stage of manufacture known as "dressed-off." They may be improved by soaking in a solution of ammonia, or a saturated solution of hyposulphite of soda, then dried. Polishing tissue was thin paper saturated with ammonia solution and dried; it is now obsolete.—*Oils, Colours and Drysalteries.*

Putz Pomades.—The *Journal der Goldschmiedekunst* gives the following formulas for polishing pomades:

1. Anhydrous sodium carbonate	5 parts.
Tallow soap	20 parts.
Levigated emery	100 parts.
Water	100 parts.

Mix, put on the water-bath and heat, under constant agitation, until a smooth, homogeneous paste has been obtained.

2. Jewelers' rouge	1 part.
Petrolatum	1 part.
Oil of mirbane, q. s. to perfume.	

Mix intimately.

3. Oil of turpentine	1 part.
Levigated emery, finest	1 part.
Jewelers' rouge	2 parts.
Petrolatum	2 parts.
Oil of mirbane, q. s.	

Rub up together to a homogeneous pomade.

4. Emery flour, finest levigated	50 parts.
Jewelers' rouge, finest	50 parts.
Mutton suet	40 parts.
Oleic acid, crude	40 parts.
Perfume, q. s.	

Melt the suet and oleic acid together in the water-bath, and when thoroughly mixed remove from the fire. When cooled down, but still soft, add the powders, and rub up until they are evenly distributed throughout the mass. The perfume may be added at the same time as the powders.

5. Stearin	8-9 parts.
Mutton suet	32-38 parts.
Neatsfoot oil	2-2·5 parts.
Jewelers' rouge, finest lev'd	20 parts.
Lev't'd calcium carbonate	40-60 parts.

Melt the suet, stearin and oil together, and proceed as in No. 4.

6. Quartz sand, powdered and levigated	20 parts.
Jewelers' rouge, finest lev't'd	30 parts.
Vaselin	50 parts.

Mix. Instead of quartz sand, levigated infusorial earth may be used.—*National Druggist.*

Silver Polish, Liquid.—Try one of the following:

1. Prepared chalk or whiting	2 oz.
Water of ammonia	2 oz.
Water, enough to make	8 oz.

2. Oxalic acid	1 oz.
Crocus martis	2 oz.
Whiting	4 oz.
Water, to make	1 pt.

Mix, and shake before using. This preparation may be used dry (omitting the water), or applied with a little oil with rubbing, and rubbed dry with whiting.

3. Mix 8 oz. prepared chalk, 2 oz. turpentine, 1 oz. alcohol, 4 drm. spirits camphor, and 2 drm. water of ammonia. Apply with sponge and allow to dry before polishing.

4. Cyanide potassium	8 oz.
Alcohol	1 oz.
Water of ammonia	1 oz.
Blue vitriol	½ oz.
Glauber salts	1 oz.
Soft water	2 gal.

Immerse the silverware in the bath for a few minutes, rinse with clear water, and polish with chamois skin or flannel.

5. Use a saturated solution of hyposulphite of soda, to which a little bolted whiting has been added. Apply with brush or cloth, and rub till the tarnish is removed.—*Pharmaceutical Era.*

Stones, etc., to Polish.—A correspondent in *Science Gossip* gives the following as the best method: Get a piece of lead nine inches by four, and with emery and water grind down to a flat surface; if now ground on a piece of snake stone, it will make the specimen quite smooth. To polish, nail over a piece of deal board three thicknesses of cloth, strew some putty powder over this, wet with water, and rub until a polish is produced; a fine finish can be obtained by using another board with jeweler's rouge instead of putty powder.

Wood, Polishing of.—Dark Polish.—Ten oz. methylated alcohol, 2 drm. powdered myrrh, 2 oz. shellac, 1½ oz. Florence oil, 1 drm. oxalic acid, 1 oz. dragon's blood.

To Polish New Wood.—First give a coat of isinglass dissolved in water very thin, smooth it over with fine glass paper, then dissolve in 4 oz. of wood naphtha, 1 oz. orange shellac, and 2 drm. benzoin. Stain with dragon's blood to color required.

For Delicate Cabinet and Papier Mache Work.—Linseed oil, 16 oz.; spirit, 8 oz.; vinegar, 8 oz.; butter of antimony, 2 oz.; oil of turpentine, 8 oz. Shake well before using and apply with a woolen rubber.

Oil of turpentine, 16 oz.; rectified oil of amber, 16 oz.; olive oil, 16 oz.; oil of lavender, 1 oz.; tincture of alkanet, 4 drm. Mix.

A cotton rubber is saturated with this polish, which is thus applied to the wood. The latter is then well rubbed with soft dry cotton rags and wiped dry.

Potatoes, to Solidify.—Make a solution of 4 parts of sulphuric acid in 50 parts of water. Treat peeled potatoes with this solution for thirty-six hours. Dry the mass between blotting paper and subject to great pressure. By using very strong pressure, billiard balls have been made closely resembling ivory. The material can be carved and doubtless could be used for large types.

Potpourri, How to Make. — The never-failing delight of a rose (or potpourri) jar is known only to its fortunate possessor; yet it is so easy to prepare one, and, once prepared, so easy to keep it at the point of perfection, that the wonder is they are not more frequently enjoyed. The flowers should be gathered in the early morning, and tossed lightly on a table in a cool, airy place, to lie till the dew has evaporated; then put them in a large glass jar, sprinkling salt over ½ in. layers of the flowers. This can be added to from morning to morning till enough flowers for the purpose have been gathered, letting them

stand in the jar for ten days after the last are put in, stirring the whole every morning. Have 1 oz. each of cloves and allspice, coarsely ground, and as much stick cinnamon, broken and shredded fine; transfer the flowers to another jar, and scatter the spices, mixed together, in layers; cover the jar tightly, and let it stand in a dark place for three weeks, when the stock will be ready for the permanent jar. Whatever this jar is, be sure it is provided with a double cover.

Have ready ¼ oz. of mace and ½ oz. of allspice and cloves, all coarsely ground—or pounded in a mortar—half of a grated nutmeg, ½ oz. of cinnamon, broken in bits, 1 oz. of powdered orris root, and ¼ lb. of dried lavender flowers. Mix these together in a bowl, and proceed to fill the rose jar with alternate layers of the "stock" and the mixture of spices, etc. A few drops each of several essential oils—rose, geranium, bitter almond and orange flower are good—should be dropped upon the layers as you progress, and over the whole pour 1 oz. of your favorite toilet water or eau de cologne. This is sufficient to fill two quart jars, or one very large one, and it will keep for years; from time to time various sweet things may be added to it, as a few tube-roses or a spray of heliotrope. If the jar be left open for a half hour every day, it will fill your rooms with a delicate, indefinable spicy fragrance, very refreshing and delightful, and unlike any other perfume. The flowers chosen should be those having agreeable perfume, roses, pinks, violets, verbena, heliotrope, acacia, balm, lavender, etc.

Poultry Food.—There is a great similarity between the various poultry powders and foods. The powders are popularly supposed to increase the egg-laying power of hens. We quote a few typical formulas:

Powdered eggshell or phosphate of lime, 4 oz.; iron sulphate, 4 oz.; powdered capsicum, 4 oz.; powdered fenugreek, 2 oz.; powdered black pepper, 1 oz.; silver sand, 2 oz.; powdered lentils, 6 oz.

A tablespoonful to be mixed with sufficient food for twenty hens.

Oyster shells, ground, 5 oz.; magnesia, 1 oz.; calcium carbonate, 3 oz.; bone, ground, 1½ oz.; mustard bran, 1½ oz.; capsicum, 1 oz.; sodium chloride, 1 oz.; iron sulphate, ½ oz.; sodium carbonate, ½ oz.; sulphur, ½ oz.; beef, lean, dried and powdered, 10 oz.; fine sand, 10 oz.; corn meal, 20 oz.; linseed meal, 20 oz.

Reduce all to moderately coarse powder and mix well.

The above are formulas that are recommended by poultrymen, and pharmacists should not condemn them, even if they do seem polypharmic. Poultrymen have ideas of their own about the value of complicated formulæ.—*American Druggist.*

Powders, Baking. See **Baking Powders.**

Powders.—*Face Powder, Harmless.*—The following formula, given by Paschkis, will yield a good preparation: Magnesium carbonate, 60 parts; zinc oxide, 350 parts; talcum, 590 parts; perfume to suit.

Pink powder is produced by triturating the above with an ammoniacal carmine solution, and the yellow tint by adding to 985 parts of white powder, ½ part carmine and 15 parts yellow ocher.

Bath Powder.—Starch, 24 oz.; sodium bicarbonate, 40 oz.; tartaric acid, 36 oz.; oil of bergamot, 6 drm.; oil of lemon, 1 drm.; oil of lavender, 1 drm.; oil of pimento, 30 min.; oil of linaloe, 30 min.; heliotropin, 30 grm.

Egg and Custard Powder.—The following formulas are said to be employed by manufacturing bakers:

Egg Powder.—Sodium bicarbonate, 8 oz.; tartaric acid, 3 oz.; cream tartar, 5 oz.; turmeric, powdered, 3 drm.; ground rice, 16 oz.

Mix and pass through a fine sieve. One teaspoonful to a dessertspoonful (according to the article to be made), to be mixed with each half pound of flour. Two teaspoonfuls equal one medium sized egg.

Custard Powder.—1. Arrowroot, 8 oz.; corn flour, best, 7 oz.; saffron, powdered, 10 grn.; oil bitter almonds, 24 drp.; oil nutmeg, 12 drp.

Mix the powders in a mortar, gradually add the oils and pass through a fine sieve.

2. Arrowroot, 8 oz.; rice flour, 8 oz.; gum tragacanth, 1¼ oz.; powdered turmeric, 2½ drm.; oil bitter almond, 20 min.; oil lemon, 20 min.; oil nutmeg, 10 min.—*Pharmaceutical Era.*

3. Corn flour, 7 lb.; arrowroot, 8 lb.; oil of almond, 20 drp.; oil of nutmegs, 10 drp.; tincture of saffron to color.

Mix the tincture with a little of the mixed flours; then add the essential oils and make into a paste; dry this until it can be reduced to a powder, and then mix all the ingredients by sifting several times through a fine hair sieve.—*Montreal Pharmaceutical Journal.*

Etching Powder.—A resistive resin powder for etching purposes is prepared, according to the *Photogr. Mittheilungen*, by melting together over a low fire 20 grm. of resin, 60 grm. of shellac and 10 grm. of asphaltum; the colophony has to be melted first and the shellac and asphaltum are gradually added while stirring. The molten mass is poured in cold water, dried and ground as finely as possible. The shellac renders this resin powder extremely acid resisting.

Powder for Hardening and Restoring Freshness to Meats.—When the tissues of meats once break down there is no way, yet discovered, by which freshness can be restored to them. We can prevent further decay, remove odor, etc., but further than this we cannot go. The following formulæ all make more or less excellent meat preservatives:

1.	Borax	80 parts.
	Boric acid	17 parts.
	Sodium chloride	3 parts.

Reduce the ingredients to a powder and mix thoroughly.

2.	Sodium sulphite, powdered	80 parts.
	Sodium sulphate, powdered	20 parts.

Mix.

3.	Sodium chloride	80 parts.
	Borax	8 parts.
	Potassium nitrate	12 parts.

Reduce to a powder and mix.—*National Druggist.*

Nursery Powders.—Anti-chafe Nursery Powder, Hood & Co.—Powdered fuller's earth, 9 oz.; powdered boric acid, 1½ oz.; powdered oxide zinc, 3 oz.; powdered starch, 9 oz.; powdered orris root, 1½ oz.; oil bergamot, 2 drm. Mix the powders thoroughly, add the oil, and pass through a fine sieve.

O. K. Baby Powder (C. W. Moister).—Oxide zinc, ½ oz.; powdered starch, 1½ oz.; boracic acid, 20 grn.; oil eucalyptus, 10 drops. Mix and rub very fine in a mortar. Dust on parts affected, as occasion may require.

Cutine or Nursery Powder (W. D. Har-

nist).—Talc (purified), 8 oz.; fuller's earth (powdered), 4 oz.; lycopodium, 4 oz.; oil rose, 5 gtt. Rub the oil of rose with the fuller's earth in a mortar until thoroughly incorporated; add the talc and lycopodium, triturate thoroughly. This makes a harmless and useful sprinkling powder and its cost will not exceed 25 cents per pound.

Pilot's Infant Powder.—(Fred J. Renner, Jr. —*Era Prize.*)—Carbolic acid, 50 gtt.; boracic acid, 1½ oz.; powdered French chalk, 14½ oz.

Triturate the French chalk with the carbolic acid gradually added; then add the boracic acid and thoroughly mix them.

Baby Powder.—Powdered French chalk, 14 oz.; powdered boracic acid, 2 oz.; ext. jasmine, 1½ drm.; ext. musk, ½ drm. Pass through fine sieve.

Nursery Powder (to Cure Severe Chafing).—Gum camphor, ¼ oz.; carbolic acid, 15 drops; oxide zinc, ¾ oz.; Eng. precip. chalk, 2 oz.; oil of neroli, 5 drops; oil of rose, 2 drops. Rub the camphor to a fine powder in a mortar; use alcohol to reduce it, and mix the other components thoroughly. Sift through a bolting cloth of 100 meshes to the inch.

This powder is invaluable for healing raw and irritated surfaces and for curing sunburn. Mixed in the proportion of 3 parts of vaseline or cold cream, it forms one of the most useful domestic remedies in the way of a general healing salve that can be suggested.

Infant Powder.—Kaolin, 1 lb.; pulv. orris, Florentine, 4 oz.; oil sandal, 40 drops.

Stamping Powder.—Pigment, 1 oz.; sandarac, 1 oz.; white resin, 2 oz. The mixture should be passed through a very fine sieve. The pigments preferably employed are Prussian blue, vermilion, chrome green and yellow, white lead.

Preserving, Fruit. See **Fruit Preserving.**

Puncture Cement. See **Cements.**

Rim Cements. See **Cements.**

Roaches, Destroying.—A good plan is to render the place which the roaches frequent perfectly dry, and then coat the boards or shelves with a strong decoction of quassia. When this has become thoroughly dry, cover the boards, etc., with clean paper. Other bitter substances may be used in place of quassia. In places where articles of food, drink, or clothing are not likely to be placed, some poisonous substance, such as corrosive sublimate, may be employed. But great care should be taken that it be not applied in such manner that it can eventually be brushed off in dust. A good plan is to dissolve a little shellac in solution of borax, to add a very small quantity of bichloride, and to paint the solution into the cracks and corners. If water or dampness is kept away from the shelves or closets, the roaches will leave the place of their own accord.

Chamomile, 2 oz.; borax, 12 oz.; insect powder, 2 oz.; plaster of Paris, 1 oz.; sulphur, 3 oz.; crude arsenic (so-called cobalt), 120 grn.—*Pharmaceutical Era.*

You can make a roach poison which is practically harmless to man, by the following formula: Borax, 9 oz.; starch, 2½ oz.; cocoa, 1 oz.

Another preparation, not so inactive as to human beings, is made by mixing: Angelica root, in fine powder, 5 oz.; oil of eucalyptus, 1 oz.

Scatter at night plentifully around the haunts of the pests.

The well known insect powder obtained by grinding the flowers of certain pyrethrums is also an excellent insecticide, but not quite so convenient to use as the foregoing. The observations of some experimenters seem to show that the poisonous principle of these flowers is non-volatile, but our experience in their use indicates that these observations are not complete, as the most favorable conditions under which to use it are in a room tightly closed and well warmed. There may be two poisonous principles, one of which is volatile. Disappointment sometimes arises in its use from getting powder either adulterated or which has been exposed to the air, and, consequently, lost some of its power. When a good article is obtained and used plentifully under the conditions above indicated, it proves very efficient.—*Druggists' Circular.*

Some years ago the Editor of this book had a commercial roach powder analyzed, and the result was found to be as follows; Borax, 90 parts; corn starch, 9 parts, some red coloring matter one part. The formula is a very excellent one.

Rubber and Rubber Articles, Note on.—As regards the action of coal gas on rubber tubes, it has been observed that it is weakest on ordinary gray rubber, which withstands it the longest, and gives off no odor. Red rubber is more readily affected, and the black kind still more so.

To prevent rubber tubes from drying up and becoming brittle, they should be coated with a 3 per cent. aqueous solution of carbolic acid, which preserves them. If they have already turned stiff and brittle, they can be rendered soft and pliant again by being placed in ammonia which has been made liquid with double the amount of water.

In France rubber tubes are used as a core for casting pipes from cement and sand. In order to construct a connected pipe conduit in the ground, a groove is dug and a layer of cement mortar spread out. Upon this the rubber tube is laid, which is wrapped up in canvas and inflated. The remaining portion of the channel is then filled up with cement mortar, and as soon as it has set, the air is let out of the rubber hose and the latter is pulled out and used as before. In this manner 6-inch pipes have been produced from hydraulic lime and sand at the expense of about 1 mark (24 cents) per meter.

Artificial Rubber.—An elastic mass, similar to caoutchouc, from which rubber is made, can be produced by combining sodium tungstate with certain organic substances. If tungstic acid or sodium tungstate is added to glue and then to hydrochloric acid, a tungstic glue is produced which, at 85° to 105° F., is so elastic that it may be drawn out into very thin fibers. By cooling, this mass becomes very firm and brittle. This product may be used for mordanting specially for aniline dyes. It was also employed for tanning leather, but turned with it as hard as stone, for which reason it has not entered greatly into use.

To rid rubber articles of their unpleasant odor, both sides are covered with a layer of animal charcoal and heated with it to 50° to 60° C.

To cover cloth with rubber, there are chiefly employed for dissolving the rubber, naphtha, alcohol and benzol. They are mixed with purified solid paraffine, and ground together.

Cement for Rubber.—Dissolve 1 lb. of pure rubber, in small pieces, in 4 gallons of rectified coal tar naphtha, and stir diligently. After 10 to 12 days, double the weight of this liquid of shellac is to be added. This mixture is heated in an iron vessel, having a discharge pipe at the bot-

tom. When all is liquid it is poured on stone slabs and allowed to cool in the shape of plates. For use this cement is heated in an iron vessel and applied with a brush on the surfaces to be united.

Rubber boots and shoes are rendered water-proof by melting 4 parts of spermaceti and 1 part of rubber on a moderate fire, adding tallow or fat 10 parts, and lastly, 5 parts of copal varnish or amber varnish. This mixture is applied on the shoes with a brush. It should be stated that the rubber used for this purpose must be cut up very small and allowed 4 to 5 hours to dissolve.—*Die Werkstatt.*

Rubber Rings, Deodorization of.—At the meeting of the Verein der Mineralwasser-Fabrikanten (Society of Manufacturers of Mineral Waters) the following methods of killing the smell of rubber rings were proposed, says the *Zeitschrift fuer die gesammte Kohlensäure Industrie:* Treating the rubber with solutions of caustic potash or caustic soda; treatment with potash or soda, since caustic potash and caustic soda injure the rubber; boiling with alkaline soaps; boiling with lescive phenix—calcined soda with water glass; and lastly, after treatment with soda, leaving the rubber for some time in a solution of cooking salt (10-15 per cent).

Rubber Stamps, Pads for.—Dieterich gives the following in his Manual: Boil 35 parts of Japanese (tien-tian) gelatin in 3,000 parts of water until completely dissolved. Strain, while boiling hot, through flannel, add 600 parts glycerine, return to the fire, and evaporate to 1,000 parts. With this liquid as a basis, make the ink of the color desired, using 60 parts of methyl-violet (3 B) for violet, 80 parts eosin (B B N) for red, 80 parts of phenol blue for blue, 50 parts anilin green for green, and 100 parts of nigrosin for black. With this ink saturate the cushion of the pad box and cover with mull. If at any time the surface becomes too dry, moisten with water or glycerine. The same author gives the following formula for

Glycerine Stamp Ink.

Aniline water-blue 1 B..	3 drachms.
Distilled water.	10 drachms.
Acetic acid.	2 drachms.
Alcohol.	1½ ounces.
Glycerine enough to make.	10 ounces.

Make a solution by rubbing in a mortar. In the same way inks of the following colors may be prepared with the above compound menstruum, substituting, of course, the pigment named for the aniline water-blue in the formula given:

Violet: Methyl-violet (3 B).	2 drachms.
Red: Diamond fuchsin (I).	2 drachms.
Green: Aniline green (D). .	4 drachms.
Brown: Vesuvin (B).	5 drachms.
Black: Deep black (E). . . .	3 drachms.

For bright red omit the acid from the solution, replacing it by water, and using three drachms of eosin (B B N).

Rust.—*Metal, Protective for Polished.*—Resin, 35 parts; talc, in powder, 500 parts; lard, 250 parts; yellow wax, 130 parts; olive oil, 130 parts; oil of turpentine, 130 parts.

Mix the resin, lard, wax, and oil, and melt at a low temperature. When melted, stir in the talc, and, after removing from the fire, add the turpentine, with constant stirring.

Nickel Plating, to Protect from Rust.—In putting away a bicycle for the winter, every part should be thoroughly cleaned from dirt, the running parts duly oiled and the bright parts wiped with a mixture of vaseline and paraffine, 2 parts vaseline, ½ part paraffine, to which add a half part of finely ground quicklime by heating and stirring. Apply warm by wiping all the nickel parts, and wrapping them in paper which has been coated on one side by the mixture, very thin, which will keep off dust and dampness. The japanned parts and saddle should also be nicely covered with wrapping paper to keep off dust, which injures the japan by long contact.

Screws, Rusting of.—To prevent screws employed to join machinery from becoming fixed and difficult to remove from oxidation, the *Moniteur Industrielle* recommends a mixture of oil and graphite, and says it will effectually prevent screws from becoming fixed, and protect them for years from rust. The mixture facilitates tightening up, and is an excellent lubricant, and reduces the friction of the screw in its socket. Carbon, of which graphite is largely composed, is the best known lubricant.

Steel, to Remove Rust from.—Cover the rusted part with oil or fat, let it remain three hours, wipe off with cloth; take 2 drm. caustic potash and 4 oz. opodeldoc; rub on the mixture and let it remain ten minutes, rub off dry with cloth. Or, cover the rusted parts with sweet oil, well rub in, and next day cover with finely powdered unslaked lime; polish with this until the rust disappears. Or, take ½ oz. emery powder, 1 oz. soft soap, mixed, and well rub in.

Tin Goods from Rusting, to Prevent.—Cleanse them, wipe quite dry, and place them near the fire. With this precaution tinware will last a much longer time than usual.

Salad Dressing.—Salt, ½ oz.; sugar, 1 oz.; salad oil, 2 oz.; eggs, 2 oz. Emulsify and add tincture capsicum, 20 drp.; mustard, ½ oz.; malt vinegar, 6 oz. Mix.—*American Druggist.*

Sauces. See **Pickles, Etc.**

Sculptor's Putty (modeling compound).—Mix 200 parts dry clay or powdered soap stone with 100 parts of wheat flour; stir the mixture carefully into 300 parts of melted white wax, not too hot. If desired, the mass may be colored at pleasure. The so-called "modeling clay" may be made by kneading dry clay with glycerine instead of water. The mass must be worked thoroughly with the hands and moistened at intervals of two or three days. To prevent evaporation, it should be kept covered with a piece of rubber cloth.—*Pharmaceutical Era.*

Sea Sickness.—Mosel-Lavalée recommends as a remedy for sea sickness the following preparation: Menthol, 0·1 grm.; cocaine hydrochloride, 0·2 grm.; alcohol, 60·0 grm.; sirup, 30·0 grm. A dessertspoonful to be taken at intervals of half an hour.

Sealing Wax with Wick.—In an earthen vessel melt at moderate heat: Venetian turpentine, 30 oz.; to which add: shellac, 1 lb. 29 oz., stirring with a wooden stick, until same has also melted. Meanwhile grind: Genuine Bologna chalk, 6 oz.; magnesia, 6 oz.; vermilion 1 lb. 12 oz. into a very fine powder and introduce this into the mass. After the mass has been thoroughly mixed, pour in: Turpentine, 7 oz.; mastic dissolved in turpentine, 3 oz.; Peruvian balsam, 3 oz. Heat again and mix well, whereupon the finished sealing wax can be poured into moulds. The wick consists of 6 to 10 cotton threads, which are saturated with wax or stearine. The wicks thus prepared are stretched in specially made moulds, whose

open part is provided with a funnel, through which the sealing wax mass is poured in. The wick itself is stretched firmly. For blue, fine ultramarine blue is used, for yellow finely prepared perfectly anhydrous chrome yellow, for black, very finely prepared ivory black.—*Oel-und Fetthandel.*

Size.—*New.*—A new glue size for paper makers' use, which is nearly 50 per cent. cheaper than the old kinds and more suitable for the purpose, is prepared as follows: Dissolve in a copper pan, heated by indirect steam, 20 to 22 kilo. (44 to 48·4 lb.) of soda, in 90 to 110 kilo. (198 to 242 lb.) of boiling water; then add, stirring constantly, 140 kilo. (308 lb.) of powdered rosin, keeping the whole boiling constantly until all the rosin is dissolved, which is generally accomplished in three or four hours. The soda rosin composition is mixed together with a glue solution made by dissolving 50 kilo. (110 lb.) of glue in 140 to 150 kilo. (308 to 330 lb.) of water. Boil both solutions together for about ten minutes, after which run the mixture through a fine sieve or filter, and it is then ready for use. The best proportions for mixing the vegetable and animal sizes are, for one and a half parts of rosin add one part of glue, or, for some purposes, equal parts of each can be taken. An addition of starch, if required, can be made as usual, also the mixing of this improved size with the pulp.

Japanners' Gold Size.—Gum animi and asphaltum, each 1 oz.; red lead, yellow litharge and umber, each 1½ oz. Reduce to a fine powder, mix and put them with a pound of linseed oil into a pipkin, and boil gently, constantly stirring until thoroughly incorporated. Continue the boiling until it becomes as thick as tar, as it cools. Strain through flannel, and keep for use, carefully stopped up. When wanted, grind with as much vermilion as will give it an opaqueness, and dilute sufficiently with oil of turpentine to work freely with a pencil. Or, take linseed oil, 1 lb.; gum animi, 4 oz. Boil the oil, and add gradually the gum animi finely powdered, until dissolved. Let the mixture boil to the consistence of tar on cooling, then strain while warm through a coarse cloth for use. Previous to being used, it must be mixed with vermilion and oil of turpentine, as above. This size may be used on almost any substance, and no preparation of the work is necessary, beyond having an even and perfectly clean surface.

To Use the Size.—Put a proper quantity prepared as above into a saucer. Then spread it with a brush over the surface to be gilt, or draw with it, by means of a pencil, the designs intended, carefully avoiding to touch any other parts. Let it remain until fit to receive the gold, which is to be determined in the same manner as in oil gilding, by the finger. Then go over the work with a soft camel's hair pencil. The whole being covered, it must be left to dry, and then the loose powder lightly brushed off. When gold leaf is used, the method of sizing is the same, but the operation requires more nicety. There are various sorts of gold powders—pure gold powder, Dutch, mosaic, etc., any of which can be procured at the artists' color shops ready for use. When the whole has been gilt, any parts uncovered may be repaired by wetting with a camel's hair pencil, and covering the part with gold, avoiding, as much as possible, touching the perfect gilding, as it frequently causes it to turn black.

Soaps.—*Cleaning Soap by Cold Method.*—The *Berliner Drogen Zeitung* gives the following: Cocoanut oil, 30 kilo.; soda lye, 38° B., 15 kilo.; potash lye, 20° B., 5 kilo.; "brilliant" green, 200 grm.; oil of turpentine, purified, 800 grm.; finely pulverized clay, 26 kilo.

The clay (kaolin), finely sifted, is first placed in the vat. The coloring matter ("brilliant" green) is rubbed up with a portion of the oil and the balance of the latter poured in upon the clay, and the two intimately mixed. The colored oil is next added and all well stirred together. Mix the two alkaline solutions and pour them in a strong stream into the mixture of oil and clay, agitating the latter constantly. Finally, add the turpentine under constant stirring. The resultant soap is poured into metallic boxes and closely covered. Grease spots in garments are first covered with a little of the paste, well rubbed in. Sponging with warm water afterward removes soap and spot in the most complete manner.

Laundry Soaps, the Perfumes in.—To find an oil which will effectually cover the rosin and cocoanut odor in common soaps has been the aim of the laundry soap maker for many years. Of course, there are oils that will do it, but which is preferable, mirbane or cocoanut? or citronella?

Within the last year or so there has been an oil used in Europe quite extensively to overcome this, and to make the readers of this journal acquainted with it is the object of this little article. It is the oil of pennyroyal, *Ol. Menthæ Puleggi* (not *Oleum hedeomæ*). The latter is the American pennyroyal, as different from the French oil as day is from night.

It is stronger than the majority of oils used by soap men, stronger even than mirbane, and has no obnoxious odor. Belonging, as the name indicates, to the family of mints, it has that characteristic odor, backed by a greater amount of "natural" oil camphor, which helps to hold and diffuse the odor.

In itself it would not make a good perfume, but mixed with other oils it does the work.

The following formulas are recommended, and if proper care is used in their preparation, there is little doubt of success.

1. Mixture for White Soap.—Oil French pennyroyal, 3 lb.; oil thyme, white, 1 lb.; oil lavender flowers, 1 lb.; oil caraway chaff, ½ lb. Mix and use 1 lb. to 325 lb. soap.

The cost of the above is about $1.10 a pound, and it can be used to a good deal more soap, only the house using it, making 1 lb. cakes, wanted a strong odor.

2. For Colored Soap.—Oil French pennyroyal, 1 lb.; oil cassia, 1 lb.; oil cloves, ½ lb.; oil lavender spike, 1 lb. Mix and use the same as above.

Medicated.—The base for these soaps is constructed upon the following formula, which is termed "basic soap" (*basis seife*): Mutton suet, best quality, 593 parts; olive oil, 74 parts; caustic soda, 222 parts; caustic potash, 111 parts. Mix and make a soap.

1. Resorcin and Salicylic Acid Soap.—For the treatment of parasitic and seborrhœic eczema; also of great service in psoriasis, acne and ichthyosis; Basic soap, 94 parts; salicylic acid, 3 parts; resorcin, 3 parts. Mix.

2. Resorcin, Salicylic Acid and Sulphur Soap.—For use in acne vulgaris and acne rosacea, and in seborrhœic eczema, marked by deep infiltration of the skin: Basic soap, 84 parts; resorcin, 3 parts; salicylic acid, 3 parts; sulphur, precipitated. Mix.

3. Resorcin, Salicylic Acid, Sulphur and

Tar Soap.—For use in squamous eczema and psoriasis vulgaris: Basic soap, 79 parts; resorcin, 3 parts; salicylic acid, 3 parts; precipitated sulphur, 10 parts; liquid tar, 5 parts. Mix.

4. Quinine Soap.—Found to be valuable in pityriasis versicolor, in the treatment of which it is made into a lather and the latter allowed to dry on the affected parts: Basic soap, 97 parts; quinine sulphate, 3 parts. Mix.

5. Iodoform Soap.—For use in the treatment of ulceration in the legs, etc.: Basic soap, 95 parts; iodoform, 5 parts. Mix.

6. Creolin Soap.—For treatment of contagious impetigo, itch, intertrigo and hyperidrosis: Basic soap, 95 parts; creolin, 5 parts. Mix.

7. Ergotin Soap.—Used in cases of arterial hyperæmia of the skin (such as acne rosacea, congelations, varicose eczema, cicatrices marked by vascular dilatation, etc.); Basic soap, 95 parts: ergotin, 5 parts. Mix.

8. Iodine Soap.—Used in the treatment of scrofula, tumefaction of the superficial ganglia, chronic tumefaction (epididymitis, etc.), specific ulcerations and exanthemata, parasitory sycosis, favus, tinea, tonsurans, pityriasis versicolor, etc.: Iodine, resublimed, 6 parts: potassium iodide, 3 parts; basic soap, 191 parts. Mix.

9. Salicylic Acid and Creosote Soap.—Salicylic acid, 5 parts; creosote, 2 parts; basic soap, 93 parts. Mix.

This soap has been found of great service in the treatment of lupus, psoriasis, seborrhœic eczema, parasitic sycosis, favus and tinea tonsurans.—*Nouveaux Remèdes.—Nat. Druggist.*

The following table shows the oily and fatty matters which may be used for making the soft curd, and the strength and quantity of the soda lyes deemed most suitable for speedily affecting their saponification. The weight of lye required to saponify each 100 lb. of fatty matter may be found by dividing the number of degrees by the strength of the lyes applicable to each kind of fat.

Fat to be used.	Quantity of Lye in Degrees Baumé.	Strength of Lye Degrees Baumé.
100 lb. tallow require	3,800°	14°-15°
100 lb. palm oil require	3,200°	16°-18°
100 lb. tallow olein require	2,800°	16°-18°
100 lb. rosin require	2,700°	16°-22°

The fats that may be used for making the hydrated soap, and the quantity and strength of the lyes required for saponification, are the following:

Fat to be used.	Quantity of Lye in Degrees Baumé.	Strength of Lye Degrees Baumé.
100 lb. tallow require	3,800°	11°
100 lb. cocoa nut oil require	4,100°	16°-20°
100 lb. palm oil require	3,200°	18°-22°
100 lb. lard require	3,460°	13°
100 lb. tallow olein require	2,800°	18°-22°
100 lb. olive oil require	3,000°	16°
100 lb. rape seed oil require	2,400°	24°-28°
100 lb. linseed oil require	2,400°	24°-28°

Soldering.—*Aluminum Soldering.*—The inventors claim that surfaces of aluminum may be successfully soldered to each other, and to other metallic surfaces, by using silver chloride as a flux in conjunction with ordinary solder.

The pieces of metal, one or both of which are aluminum, are placed in the relative position required in the joint, finely powdered fused silver chloride spread along the line of junction, and solder melted on with a blow-pipe or other device. The joints are thus easily and rapidly obtained, and become hard and perfectly sound on setting, and neither crack, flake, nor check.—F. J. Page and H. A. Anderson, Waterbury, Conn.

Another new solder for aluminum has been brought out in the United States under the title of Green's aluminum solder. It is stated to be composed of zinc, 50·03 per cent.; tin, 47·99; aluminum, 1·76; and phosphorus, 0·22 per cent. It is not used with any flux, simply requiring the aluminum faces to be cleaned and coated with the solder, then a clean hot bit is used to wipe the joint to be made.

Hard Solder for Brass.—The Physico-Technical Imperial Institute (Physisch-technischer Reichs-Anstalt) has conducted tests with hard solders for brass, obtaining the following results:

The hard solders are known to consist mainly of copper, zinc, and lead or tin, sometimes with admixtures of cadmium or bismuth. Fifty-three hard solder alloys were tested, and it was found that the drawbacks which so many hard solders possess are due chiefly to the disparity between the brass of commerce and that of the small brass foundries, aside from the unequal and unsuitable composition of the solder material.

Hard solder of brass and zinc must only be prepared with special reference to the metal which is to be soldered.

The following is a typical formula: Copper, 46 parts, and zinc, 54 parts. Such a solder, however, though sufficiently malleable on the whole, is not fusible for general use. By the addition of 3 per cent. of tin, it is true, the fusing point is lowered, but the malleability is practically arrested, thus making the durability of the soldering doubtful. Admixtures of slight quantities of readily fusible metals have only little influence upon the lowering of the point of fusion; but as soon as they are added in such amounts that the fusing point goes down considerably, the malleability is arrested in every case.

Cadmium is entirely unsuitable for the production of readily fusible hard solders, since it causes them to oxidize strongly in the fire and consequently to fuse very sluggishly.

As regards malleability and ready fusion, during the melting, only one hard solder remained of the fifty-three tested: it contained, besides copper, only zinc and silver. The Imperial Institute has determined on the following composition as being practical:

a. Of good fusion: Copper, 48 parts: zinc, 48 parts: silver, 4 parts.

b. Of ready fusion: Copper, 43 parts; zinc, 48 parts; silver, 9 parts.

c. Of quick fusion: Copper, 38 parts; zinc, 50 parts; silver, 12 parts.

The property of being thinly liquid, of these solders, as well as their malleability, is not attained by any other solder; the latter property even excels that of the best copper-zinc solder twice over. They do not turn black in pickling, like all readily fusible hard solders containing tin and zinc,

but are characterized by a pleasant, gold-like color, so that goldsmiths and jewelry manufacturers may also use them with advantage.

According to the Imperial Institute, the Ulm Brass Works are now manufacturing hard solders which are sold in the market as silver hard solders 1, 2, and 3. In order not to have the points of fusion lie too closely together, this firm has given its silver solders the following composition:

1. Copper, 50 parts; zinc, 46 parts; silver, 4 parts; of good fusibility.
2. Copper, 43 parts; zinc, 48 parts; silver, 9 parts; of ready fusibility.
3. Copper, 46 parts; zinc, 52 parts; silver, 12 parts; of quick fusibility.

For general use in workshops, but especially for wholesale manufacturing, solder No. 2 is recommended. No. 1 is suitable for first soldering, while No. 3 is used for third soldering, and is to replace all quickly fusible hard solders containing tin and much zinc. The slight increase in cost caused by the utilization of silver is amply counterbalanced by reliable working and time gained.—*Journal der Goldschmiedekunst.*

Hard Soldering with Acetylene.—The flame of acetylene is exceedingly useful for hard soldering, says *Neueste Erfindungen und Erfahrungen.* Its temperature is as high as can otherwise be obtained only with a special blowing apparatus. The heating power of acetylene is likewise very great. The use of acetylene is desirable in places where no connection with a gas house or electric central station can be had.

Nickel, Solders for.—For fine or high grade nickel: Three parts of yellow brass, 1 part of sterling silver. For low grade nickel: Fifteen parts of yellow brass, 5 parts of sterling silver, 4 parts of zinc (pure or plate zinc). Melt the brass and silver with borax for a flux, and add the zinc in small pieces, stir with an iron rod, pour into a slab mould, and cool slowly, when it can be rolled thin for cutting.

Soldering Fluid, Acid—Free.—For the production of antacid soldering fluid, sheet zinc waste is placed in hydrochloric acid. As regards quantity, enough should be used, that after complete saturation there is still an excess of zinc. After a few days the excess of zinc should be removed and the solution diluted with equal volume of water and filtered. Now add liquid ammonia, drop by drop, until the precipitate forming in the beginning has just dissolved again. If the solution of ammonio-zinc chloride is mixed with starch paste, a sirupy liquid is obtained which is employed as soldering paste in cases where the shape of the article to be soldered does not well admit the use of liquid soldering water. The water is well adapted for soldering tin plate, iron, and brass. The solder for galvanized iron wire consists of lead, 3 parts, and zinc, 1 part.—*Zeitschrift für Blechindustrie.*

Soldering Grease.— Melt together 5 parts of colophony and 5 parts of tallow and add 1 part of finely powdered sal ammoniac.—*Neueste Erfindungen und Erfahrungen.*

Soldering Cast Iron.—To solder cast iron, clean the place to be soldered well, then brush it with a brass wire brush until the iron becomes yellow. It will be found that the solder can now be applied without any trouble.—*La Science en Famille.*

Specific Gravity.—The following was received too late to be put in under Gravity, Specific, which see for additional information. Specific Gravity. Determination of Specific Gravity.

Solids.—1. Solids heavier than, and insoluble in, water.—

a. By weighing in air and water.—

$$\text{Sp. gr.} = \frac{\text{(weight in air)}}{\text{(loss of weight in water)}}$$

b. By Nicholson's hydrometer. Let w_1 be the weight required to sink the instrument to the mark on the stem, the weight of the instrument being W; to take the specific gravity of any solid substance, place a portion of it weighing less than w_1 in the upper pan, with such additional weight, say w_3, as will cause the instrument to sink to the zero mark. The weight of the substance is then $w_1—w_3$. Next transfer the substance to the lower pan, and again adjust with weight w_4 to the zero mark.

$$\text{Sp. gr.} = \frac{w_1—w_3}{w_4—w_3}$$

c. By the specific gravity bottle (applicable to powders). Weigh the flask filled to the mark with water, then place the substance, of known weight, in the flask, fill to the mark with water, and weigh again.

$$\text{Sp. gr.} = \frac{\text{(weight of substance in air)} + \text{(weight of flask and water)} - \text{(weight of flask and water and substance)}}{\text{(weight of substance in air)}}$$

2. Solids lighter than, and insoluble in, water. The solid is weighted by a piece of lead of known specific gravity and weighed in water.

$$\text{Sp. gr.} = \frac{\text{(weight of substance in air)}}{\text{(weight of lead in water)} - \text{(weight of lead and substance in water)} + \text{(weight of substance in air)}}$$

3. Solids heavier than, and soluble in, water. Proceed as in 1 *a*, using instead of water some liquid without action on the solid.

(weight of bulk of liquid equal to substance) = (weight of substance in air) — (weight of substance in liquid).

$$\text{(weight of bulk of water equal to substance)} = \frac{\text{(weight of bulk of liquid equal to substance)} \times \text{(sp. gr. of water)}}{\text{(sp. gr. of liquid)}}$$

$$\text{Sp. gr.} = \frac{\text{(weight of substance in air)}}{\text{(weight of bulk of water equal to substance)}}$$

Liquids.—1. By the hydrometer.

2. By the specific gravity bottle.

Weigh the bottle filled to the mark with water, and again when filled to the mark with liquid.

$$\text{Sp. gr.} = \frac{\text{(weight of liquid and bottle)} - \text{(weight of bottle)}}{\text{(weight of water and bottle)} - \text{(weight of bottle)}}$$

Staff.—"Staff," which is so extensively used at all expositions, is a composition of plaster of Paris and fiber with some other materials, as alumina, glycerine, dextrine, etc., according to the special casting which is to be made, or the kind of model to be employed. To prevent brittleness, the material is cast around coarse cloth backing, open, and wire cloth is embedded in it for many purposes. The material was first used in the Paris Exposition buildings, 1878. Its natural color is a murky white, but other colors may be produced by external washes, while the castings may be made to accurately represent cut stone, rock-faced stone, mouldings and the most delicate designs of every kind. For the lower patterns of the walls, the material is mixed with

cement to make it hard. Gelatine moulds are usually used, although where there is no undercut, plaster, wax or sulphur moulds may be employed, or wood or metal forms.

Staining.—*Grasses, to Stain.*—All the varieties of grass are coated on their surfaces with a material resembling glass—a hard, impenetrable substance, and which is very visible on common cane. On this account it is with difficulty that the dyer can impart any great variety of color to such materials, and it accounts for the little variety of color that is seen in the straw hat trade. Were it not for this difficulty, it is more than probable that straw bonnets would be seen in all the colors of the rainbow. Although the colors are by no means bright, yet it is possible to stain grasses sufficiently for many ornamental purposes. Many of the grasses are so exceedingly beautiful in form that they are frequently gathered, and, when dry, are made up into pretty ornaments for the sitting room. If, however, some of the specimens are not artificially colored when grouped together, they have rather a somber appearance, owing to their sameness of tint. A little variety of color may be imparted thus:

Blue is given by dipping the grasses into a boiling hot solution of indigo in sulphuric acid.

A light blue can be given by diluting with water the above solution to the desired shade.

Yellow is imparted by steeping the grass in a boiling decoction of turmeric.

Red, by boiling shreds of scarlet cloth in water containing a little alum.

Green is imparted by placing the grass first in a hot solution of sulphate of copper, and then in a bath of common soda in water, and also dyeing the grass first blue and then yellow.

Black and slate colors are produced by first dipping the grass in a decoction of logwood, and afterward in a solution of sulphate of iron. Other tints are procured by varying the bath with prussiate of potash, chromate of potash, Brazil wood, archil, and many other chemicals.

Paper and Parchment, to Stain.—Blue.—Stain it green with the verdigris stain, and brush over with a solution of pearlash (2 oz. to the pint) till it becomes blue.

Green and Red.—Dissolve verdigris in vinegar, and brush over the hot solution until of a proper color.

Orange.—Brush over with a tincture of turmeric, by infusing an ounce of the root in 1 pt. 90 per cent. alcohol; let this dry, and give another coat of pearlash solution, made by dissolving 2 oz. of the salt in 1 qt. water.

Purple.—Brush over with the expressed juice of ripe privet berries; then go over the work several times with a decoction of logwood; when dry give a coat of potassium carbonate solution (1 drm. to 1 qt.). Cover evenly.

Yellow.—Brush over with tincture of turmeric. Add annatto or dragon's blood to the tincture. Brush over as usual.

Steel, Etching on. See **Etching.**

Stone, Artificial.—Ten parts silicic acid, powdered and freed from impurities, are mixed with 90 parts of water and 100 of quicklime, all by weight. 100 parts of the product are mixed with 100 parts of sand and 5 parts magnesia or fluorspar, and the mass moulded as desired. The articles are allowed to dry for 12 to 24 hours, and subjected to steam pressure under ten atmospheres pressure for 48 to 72 hours, after which they are treated with boiling saturated calcium chloride solution at a pressure of ten atmospheres for six to twelve hours. They may then be dried by air or the circulation of steam. Marble, magnesia, magnesium limestone, etc., may be substituted for the sand. The stones thus formed are said to resemble marble, sandstone, granite, etc., closely, to be fireproof, and to resist the action of the weather as well as natural stones.—*C. Geo. Berlin, Germany.*

Storm Glasses.—Dissolve 10 grm. of camphor, 5 grm. of saltpeter, 5 grm. of sal ammoniac, in 105 grm. of alcohol (90 per cent.) and 45 grm. of distilled water. After filtering, fill glass tubes 2 cm. wide and 50 cm. long with this solution, cork up well below and above, seal and fix on boards by means of wire, similar to barometers. The changes of the solution signify the following: Clear liquid, bright weather; crystals at bottom, thick air, frost in winter; dim liquid, rain; dim liquid with small stars, thunder storms; large flakes, heavy air, overcast sky, snow in winter; threads in upper portion of liquid, windy weather; small dots, damp weather, fog; rising flakes which remain high, wind in the upper air regions; small stars in winter on bright sunny day, snow in one or two days. The higher the crystals rise in the glass tube in winter, the colder it will be.—*Neueste Erfindungen und Erfahrungen.*

The formula for storm glasses in the body of the book is erroneous, and the present formula should be used.

Stove Polish. See **Blacking, Stove.**

Summer Drinks.—From the *British and Colonial Druggist* we take the following formulas, which are perhaps equal or superior to those given in other parts of the book.

Lime Fruit Syrup.—A very pleasant and cooling drink is made of: Citric acid, 3 oz.; sugar, 7 lb.; boiling water, 1 gal.; coloring, q. s. Dissolve.

Cinnamon Syrup.—Oil of cinnamon, 8 min.; tincture of capsicum, 2 drm. Dissolve and add to a solution of sugar, 7 lb., in boiling water, 1 gal.

Framboise Syrup.—Raspberry syrup, 1 pt.; currant syrup, 2 pt. The mixtures of the various fruit syrups give rise to many other names, and we omit other formulas.

Chocolate Syrup.—Selected chocolate, 1 lb.; water, 4 pt. Have the chocolate rubbed well to powder or by means of a Keystone beater or other suitable apparatus, thoroughly incorporate, adding 4 lb. sugar; bring to boiling point with constant stirring; remove from the source of heat; continue the use of the mechanical stirrer for 20 minutes; when cold, add extract vanilla, 1 oz.; essence cinnamon, ¼ oz.; and enough thin syrup to make 1 gal.

Much depends upon the selection of the chocolate, and here inquiry finds that our friends differ as to preference. Avoid scorching, and this means constant attention and stirring.

Coffee Syrup.—Java coffee, 2 lb. (ground very fine); mix 2 pt. of alcohol with 6 pt. of water; moisten the coffee, and in a suitable percolator add the remaining liquid to thoroughly exhaust the coffee. At a very gentle heat evaporate the alcohol, and add 4 lb. of sugar. Make to the measure of 1 gal, by adding thin, plain syrup.

Cream Syrup.—In making cream syrup avoid heat. 1. Cream, 1 pt.; milk, 1 pt.; sugar, 1 lb.

2. Condensed milk (without sugar), 1 pt.; water, 1 pt.; sugar, 1½ lb.

3. Condensed milk (with sugar), 1 can or ½ pt.; water, ½ pt.; thin syrup, 1 pt.

Egg Phosphate Syrup.—Lemon syrup, 2

pt.; orange syrup, 2 pt.; eggs, 32; phosphoric acid (U. S. P.), 1 to 2 fl. oz.

Thoroughly incorporate this with a Keystone beater. Draw 1½ to 2 fl. oz. in large tumbler, and fill with carbonated water.

Fruit Phosphates.—Strawberry syrup, 8 fl. oz.; pineapple syrup, 8 fl. oz.; cherry syrup, 8 fl. oz.; pear syrup, 8 fl. oz.; dilute phosphoric acid or phosphate solution, 1 fl. oz.

Orgeat Syrup.—Cream syrup, 8 fl. oz.; vanilla syrup, 8 fl. oz.; essence bitter almond, 1 fl. dr.

New Lemon Syrup.—The separation of citral from oil of lemon gives a product of delicious odor and taste. It is proposed to utilize this as follows: Oil lemon, 14 gr.; citral, 1 gr. Dissolve this in a little deodorized alcohol, and add it to simple syrup, 100 kilos.

The pamphlet of Schimmel & Co. says this yields a perfectly clear and very aromatic syrup. Citral is obtained from quite a variety of other oils than lemon, as limetta oil, mandarine oil, lemongrass oil, eucalyptus oil, backhausia oil, citronelle fruit oil, Japan pepper oil, and ere long we may hear of many other sources from which it may be obtained.

Tanning Hides for Robes.—The hides should be very thoroughly soaked in order to get a complete softening. For dry hides this will require a longer time than for salted. A heavy hide requires longer soaking than a skin. Thus, it is impossible, says *Hide and Leather*, to fix a certain length of time. After soaking, the hide is fleshed clean, and is now ready to go into the tan liquor, which is made up as follows: one part alum, 1 part salt, ¼ to ½ part japonica. These are dissolved in hot water in sufficient quantity to make a 35° liquor. The hide, according to the thickness, is left in the tan from five to ten days. Skins are finished in about two or three days. The hide should be run in a drum for about two hours before going into tan, and again after that process. In tanning hides for robes, shaving them down is a main requisite for success, as it is impossible to get soft leather otherwise. After shaving put back into the tan liquor again for a day or two and hang up to dry. When good and hard, shave again and lay away in moist sawdust and give a heavy coat of oil. When dry, apply a solution of soft soap; roll up and lay away in moist sawdust again. Now run the hides on a drum or wheel until thoroughly soft. The composition of the tan liquor may be changed considerably. If the brownish tinge of the japonica be objectionable, that article may be left out entirely. The japonica has the effect of making the robe more able to resist water, as the alum and salt alone are readily soaked out by rain.—*Shoe and Leather Facts.*

Tattoo Marks, to Remove.—Make a mass, the consistency of dough, with salicylic acid and glycerine; apply to the tattoo marks and confine with a compress and strips of adhesive plaster for one week. Then remove the layer of epidermis over the marks and apply salicylic acid and glycerine as before. It may be necessary to repeat three time, but usually the second application removes the marks.—*Medical Brief.*

Tinning Brass.—Small articles of brass like hooks and eyes may be covered with a thin coating of tin by any of the following methods:

1. Make a saturated solution of cream of tartar in boiling water; place the articles to be coated between sheets of tin, immerse in the liquid, and boil until a sufficient deposit has been obtained. The brass should be freshly cleansed by immersion in dilute acid and subsequent washing or otherwise, just before being submitted to the tinning operation. The articles after being coated are washed in water and brightened by being shaken with bran.

2. Boil peroxide of tin with a strong, aqueous caustic potash solution, until the liquid is saturated with tin, and immerse the articles in this solution.

3. Roseleur recommends the following method: Prepare a solution of chloride of tin in crystals, 6 parts; pyrophosphate of sodium, 60 parts; distilled water, 3,000 parts.

Place the articles on perforated zinc trays, immerse in the solution, and boil, stirring the contents occasionally to change the points of contact.

The zinc trays are to be scraped clean after each operation to insure perfect contact in the next.—*Druggists' Circular.*

Tire Cements. See **Cements.**

Tomato Catsup. See **Catsups.**

Tomatoes, Preserving.—Take the best, firmest, and not over-ripe fruit, scald and skin carefully, take the stem out with a penknife, being careful not to cut the tomato and let the juice out; place in a jar, some with the stem and some with the flower end next to the glass. Cook some juice, adding a little salt, and pour over the whole tomatoes until the jar is nearly full. Place the jars in a common fish boiler of oblong shape, with a cloth at the bottom to protect them from the heat of the fire, which is liable to crack them. Fill the boiler with cold water and bring to nearly boiling point, or sufficient to heat the tomatoes clear through, and seal the jars. In about five minutes take off the jar cover to let gas out and allow the tomatoes to settle; then fill up with boiled juice and seal again. Next day screw the tops tight and put away in a dark, cool place.—*Agricult. Journ.*

For tomato catsups, etc., see **Pickles,** etc., above.

Transferring.—*Transferring Pictures, Prints, etc.*—In order to transfer prints of various kinds to glass, wood, etc., soak them for a short time in a solution of 10 parts of potassium hydrate in 90 parts of alcohol (more or less). This procedure is to soften the varnish in the printer's ink. After rinsing in pure water the print is placed face down on the plate which is to receive the picture or print, covered with a dry sheet and then pressed with squeegee or in a letter press.

Colored prints are painted over with a colorless, sticky varnish, pressed against the object intended to receive them, and, when dry, the paper is removed by rubbing cautiously with an aqueous solution of potash.

Some years ago a French typographical journal gave the following curious process for the reproduction of any printed design whatever—pictures, printed pages, etc. The paper to receive the reproduction is treated with the following, which is applied with a sponge, or, preferably, with a soft, flat brush:

Gelatine	10 parts.
Ferric chloride	22 parts.
Tartaric acid	10 parts.
Zinc sulphate	10 parts.
Distilled water	400 parts.

Mix in the dark, and keep in a deep, orange-colored glass bottle (an ordinary bottle, tightly covered with a heavy, yellow-colored paper, and kept in a close pasteboard box, will answer). The coating

should be applied in a dark place, and the paper dried in the dark. When dry, place the design on the coated surface, and bring into close contact. Place on a sheet of glass, cover with another, clamp together, and expose to the direct rays of the sun until the yellow cover of the surface of the sensitive paper is bleached to a white. Remove from light, and develop by leaving for three or four minutes in the following:

Gallic acid	2 parts.
Alcohol	7 parts.
Distilled water	100 parts.

If left exposed exactly the right length of time, the lines will appear on a white ground of an intensely black color. If exposed too long, they will become more or less gray.—*Pharmaceutical Era.*

Wood, to Transfer Prints to.—First varnish the wood once with white hard varnish, then cut off the margins of the print which should be on unsized paper. Wet the back of it with a sponge and water, using enough water to saturate the paper, but not so as to be watery on the printed side. Then, with a flat camel's hair brush, give it a coat of transfer (alcohol) varnish on the printed side, and apply it immediately, varnished side downward, on the woodwork, placing a sheet of paper on it and pressing it down evenly with the hand till every part adheres. After standing a short time, gently rub away the back of the print with the fingers, till nothing but a thin pulp remains. It may require being wetted again, before all that will come (or rather ought to come) off is removed. Great care is required in this operation, that the design or printed side be not disturbed. When this is done and quite dry, give the work a coat of white hard varnish, and it will appear as if printed on the wood.

How Newspaper Pictures can be Transferred.—Prepare a liquid by dissolving 1½ drm. common yellow soap in 1 pt. of hot water, adding, when nearly cold, 3¼ fl. oz. spirits turpentine, and shaking thoroughly together. This fluid is applied liberally to the surface of the printed matter with a soft brush or sponge (being careful not to smear the ink, which soon becomes softened) and allowed to soak for a few minutes; then well damp the plain paper on which the transfer is to be made, place it upon the engraving and subject the whole to moderate pressure for about one minute. On separating them a reversed transfer will be found on the paper.

Vapors for Inhalation.—The following are selected by the *Monthly Magazine of Pharmacy* from the formulæ used at the Hospital for Diseases of the Throat in London:

Vapor Caryophylli.—

Oil of cloves	30	min.
Light carbonate of magnesia	15	grn.
Water	3	oz.

Vapor Cassiæ.—

Oil of cassia	20	min.
Light carbonate of magnesia	10	grn.
Water	3	oz.

Vapor Cinnamomi.—

Oil of cinnamon	20	min.
Light carbonate of magnesia	10	grn.
Water	3	oz.

Vapor Creosoti.—

Beechwood creosote	3	drm.
Glycerine	3	drm.
Water	3	oz.

Vapor Cubebæ.—

Oil of cubebs	2	drm.
Light carbonate of magnesia	60	grn.
Water	3	oz.

Useful in laryngorrhœa.

Vapor Cubebæ c. Limone.—

Oil of cubebs	1½ drm.
Oil of lemon	½ drm.
Light carbonate of magnesia	60 grn.
Water	3 oz.

The oil of lemon is added to mask the disagreeable odor of the cubebs.

A teaspoonful to be added to a pint of water at the desired temperature, 150° F., and an additional teaspoonful to be added every five minutes during the time that the inhalation is used. Not more than three teaspoonfuls to be used on any single occasion.

Varnish.—*African Varnish.*—Dissolve 1 lb. pale African copal in 1 qt. of hot linsed oil, simmer in water bath, and add 1 pt. spirits of turpentine, and strain. Thin with turpentine if required, and bottle.

Alcohol Varnish.—For woodwork, ironwork, grilles, etc.: Sandarac, 150 to 190 grm.; shellac, 60 grm.; vegetable pitch, 120 to 130 grm.; clear turpentine, 120 to 130 grm.; ground glass, 120 to 430 grm.; alcohol, 970 to 980 grm.

The pulverized glass divides the resins, preventing them from adhering to the bottom of the vessel and retaining the foreign substances that might be mixed with them. —*La America Cientifica é Industrial.*

Benzine Varnish and Polish.—Various kinds of resin are carefully melted, according to the variety of the varnish or polish to be produced, in hermetically close kettles under addition of boracic acid and, after cooling, moistened with methylic alcohol. The liquid gums thus treated, says the *Chemiker Zeitung*, are completely soluble in benzine. The following gums enter into use: White or yellow shellac, sandarac, mastic, Manila gum lac, stick lac, etc., either alone or mixed together, according to whether the polish and varnish is to be light colored, yellow, or red, dull, or transparent. The percentage of boracic acid, gum, and methylic alcohol varies according to the quality of the resins employed and the destination of the varnish and polish, but in no case must the quantity of boracic acid exceed 5 per cent. of the resin quantity employed, and the proportion of methylic alcohol should not, even in case the hardest and most scarcely fusible gums are employed, make up more than the weight of the resin amounts to. The contents of solid substances in the varnishes should not be less than 15 per cent. and not less than 8 per cent. in the polishes. According to the inventor, the benzine varnishes cannot only entirely take the place of the spirit lacquers and polishes, but even afford the advantage of facilitating and accelerating the work, on account of the quicker evaporation of the benzine.

Black Varnish, for Sheet Iron.—Melted colophony, 60 grm.; amber, 90 grm. After fusion and cooling, add: Spirits of turpentine, 45 grm.; painters' varnish, 45 grm. If the varnish is too thick, dilute it with essence.

Dead Black, for Cl Goods and Ornamental Iron Work.— ve seed lac in 95 per cent. alcohol, fix refined lampblack with alcoho id enough seed lac varnish to mak mpblack adhere. but not enough to gloss. Strain through cheese cloth. ly with a soft varnish brush.

Brass, Varnish for.—Boil in alcohol, turmeric, 24 parts; saffron, 5 parts. This is filtered and heated, in water bath, in this tincture: Gamboge, 24 parts; elemi, 90 parts; dragon's blood, 30 parts; alcohol, 500 parts.

Boiling Water, Varnish which Resists.—Linseed oil, 1½ lb.; amber, 1 lb.; pulverized litharge, 5 oz.; powdered white lead, 5 oz.; minium, 5 oz. Boil the linseed oil in an untinned copper vessel, and suspend in it the litharge and minium in a small bag, which must not touch the bottom of vessel. Continue the ebullition until the oil has acquired a deep brown color; then take out the bag, and put in a clove of garlic; this is to be repeated seven or eight times, the boiling being continued. Before the amber is added to the oil, it is to be mixed with 2 oz. of linseed oil, and melted over a fire that is well kept up. When the mass is fluid, it is to be poured into the linseed oil; this mixture is to be boiled and stirred continually for two or three minutes. Afterward, filter the mixture, and preserve it in a bottle well corked up. When this varnish is used, the wood must be previously well polished, and covered with a thin coat of lampblack and spirits of turpentine. When it is dry, some of the varnish may be applied with a sponge, taking care that it is equally distributed on every part. This operation is to be repeated four times, being always careful that each coat be well dried before another is put over it. After the last coat of varnish, the wood must be dried in an oven, and afterward polished.

Brushes, Varnish, to Keep.—Varnish brushes should never be allowed to touch water, as it not only injures the elasticity of the hair, but a resin is deposited in the hilt of the brush which can never be thoroughly removed, and which will work out little by little when the brush is used, destroying the glossy surface which otherwise might be obtained.

Cabinet Varnish.—Fuse 7 lb. very fine African gum copal, and pour in ½ gal. pale clarified oil.

Camphorated Copal Varnish.—Take powdered copal, 4 oz.; essential oil of lavender, 12 oz.; camphor, ¼ oz.; and as much spirit of turpentine as will produce the required consistency. Heat the oil and the camphor in a small matrass, stirring them, and putting in the copal and turpentine in the same manner as for gold-colored copal varnish.

Celluloid Varnish.—As there is much interest in the celluloid preparation an abridged copy of patent No. 450,264, issued to E. N. Todd, of Newark, N. J., will be given.

My invention embodies an improved process for the production of an amyl-acetate-benzine solvent, which is produced at a relatively lower cost or by the use of a smaller quantity of acetic acid than is necessary when the ordinary process is employed.

The ingredient which has been found most useful in pyroxyline varnishes is amyl acetate, and the solution consisting of pyroxyline and amyl acetate would have valuable properties; but owing to the comparatively great expense of amyl acetate, and the necessity of using with it some thinning liquid in order to obtain with proper consistency, it has not been practicable to use it alone. A mixture of amyl acetate and benzine also has been well known as a useful solvent for pyroxyline for varnishes, but the inventor, the process of making which is hereinafter described, and which I have called an amyl-acetate-benzine solvent," are superior to a simple mixture of amyl acetate and benzine, and have qualities which a compound of those two substances formed by a simple admixture would not lead a person to expect.

Varnish.—According to my process I first mix fusel oil and a suitable hydrocarbon, such as benzine—say in the proportion of ten barrels of fusel oil and one barrel of benzine. The appearance of this mixture is similar in being cloudy to a mixture of amyl acetate and benzine; but being allowed to stand, the watery liquid settles down from the mixture, which then becomes clear. I then draw off or separate the watery part of this mixture and distill the clear mixture of benzine and fusel oil with acetic acid in the usual way of making amyl acetate from fusel oil; but I use less acetic acid to the proportion of fusel oil than is required when the amyl acetate is made from the fusel oil alone. Thus, for instance, I may use say 2½ gal. of acetic acid to 8 gal. of the mixture of fusel oil and benzine.

The distillate formed by this process is an active solvent of pyroxyline, to which more benzine can be added if required, and besides, being anhydrous and consequently valuable for the manufacture of varnishes or lacquers, possesses a solvent strength which a simple mixture of benzine and amyl acetate does not have; or, in other words, the distillate is a stronger solvent than could be expected from a simple knowledge derived from experience of mixtures of benzine and amyl acetate separately or combined in the usual way.

My new solvent, or distillate from a mixture of fusel oil and a suitable hydrocarbon, as above specified, is a useful ingredient for the usual gum varnishes, such as shellac, copal, etc., and I therefore do not limit myself to its use with a pyroxyline varnish.

Claims.—1. The process herein described of making a distillate by first mixing fusel oil and a suitable hydrocarbon; second, separating the watery part therefrom; and, third, distilling the mixture with acetic acid, substantially as described.

2. The process herein described of making a distillate by first mixing fusel oil and benzine; second, separating the watery part therefrom; and, third, distilling such mixture with acetic acid, substantially as described.

3. The improved solvent consisting of a distillate of fusel oil, a suitable hydrocarbon, and acetic acid, substantially as herein described.

4. The improved solvent consisting of a distillate of fusel oil, benzine, and acetic acid, substantially as herein described.

Chinese Varnishes.—Mix ¼ oz. of white wax and 8 oz. spirits of turpentine. When well mixed and cold, dip in your articles and hang up to dry.

Colorine is a varnish made specially for the ornamentation of fancy tin plate, lamp shades, toys, shade rollers and household utensils; also, for the protection of the tins used by canners of fruits, vegetables, lobsters, sardines, etc. It imparts a lustrous waterproof coating when applied in any of the numerous ways common to lacquerers.

It is furnished transparent and in the richest colors known, green, bronze, yellow, blue, red gold, yellow gold, and to special order. Any one can use it after a few moments' practice. Without heat it will dry hard enough for handling in half an hour, with heat in much less time. The Celluloid-Zapon Co., of Short Hills, N. J., are the makers of this preparation.

Colorless Varnish.—Dissolve 8 oz. gum sandarac and 2 oz. Venice turpentine in 32 oz. alcohol by a gentle heat. To make a harder varnish, of a reddish cast, dissolve 5 oz. shellac and 1 oz. turpentine in 32 oz. alcohol by gentle heat.

Colors, Varnish for Mixing with.—Take

1 oz. gum animi; mastic and gum sandarac, of each 2 oz.; reduce them to a fine powder, and place them in a glass vessel, pouring 1 pt. 90 per cent. alcohol over them. Hang the vessel in the sun until the ingredients become perfectly dissolved, then filter the liquor through a clean cloth, and keep it in a well-corked bottle..

Varnish for Dissolving Colors, and for giving brilliancy to paper and to all white substances:

1. Sandarac, 15 to 16 dkgrm.; mastic, in pulverized drops 61 grm.; elemi, 30 grm.; essence of lavender, 30 grm. Mix these substances and add: Alcohol, 1 k. This varnish dries quickly, is solid and brilliant.

2. Mastic in pulverized drops, 61 grm.; sandarac, in powder, 24 to 25 dkgrm.; Venetian turpentine, 122 grm.; alcohol, 1 k.—*La América Científica é Industrial.*

Collodion Varnish.—Hale's formula is as follows: Amyl acetate, 4 gal.; benzine (coal naphtha), 4 gal.; acetone, 2 gal.; pyroxyline, 2½ lb. The different ingredients are mixed and the pyroxyline dissolved therein.

The metal article, having its surface polished and made free from water and grease by any ordinary or suitable means, is or may be dipped into a solution made according to either of the formulæ, and on removal therefrom suspended in a chamber out of the draught till the adhering coat or film dries or hardens, which takes place in about 15 or 20 minutes. The drying may be hastened by artificial heat, and while the use of the heat at any stage of the process is not inconsistent with the invention, yet it is preferred to operate in the cold—that is, at ordinary temperatures. In damp weather the coating should be dried at a temperature of say 100° to 105° Fah. The varnish or solution may also be applied by brushing.

The coated articles when the coatings are dry have their metal surfaces provided with a substantial, even, hard, thin, smooth, impervious, and transparent film of pyroxyline of sufficient tenacity, adhesion, and durability practically to resist the handling and exposure to which lacquered articles in general are subjected.

Copal Varnish.—Melted copal, 600 grm.; mastic, 18 grm.; olibanum, 30 grm. The foregoing substances are dissolved in essence of lavender, 23 grm.; and then add linseed oil, 1 k.

The olibanum is a resinous gum extracted from a tree similar to the juniper, probably of the species *balsodendron,* which grows in Arabia and India.

Copal Varnish, Elastic.—Gum camphor, 60 parts; copal, 250 parts; ether, 700 parts. Keep in a bottle with a ground glass stopper; use the upper portion, which will become clear after a few days, or possibly weeks. This sediment has a new portion of the mixed substances added, the ether being in excess, only one-half as much camphor and copal being added.

Copal Varnish, Volatile.—Fine copal broken small, 12 parts; ether, 2 parts; alcohol, 12 parts; oil of turpentine, best quality, 8 to 9 parts.

Drying Varnish for Furniture.—Copal, 90 grm.; sandarac, 100 grm.; mastic, 90 grm.; turpentine, 75 grm.; ground glass, 100 grm.; alcohol, 1 k.

Durable Slow-drying Varnish.—1. Sandarac, 125 grm.; mastic in tears, 125 grm.; pulverized glass, 250 grm.; sulphuric ether, 250 grm.; 96 per cent. alcohol, 1 k. 500 grm.

2. Varnish for objects exposed to friction, such as chairs, instrument cases, jambs, metals, etc. Liquid copal, 9 dkgrm.; sandarac, 18 to 19 dkgrm.; pure mastic, 9 dkgrm.; ground glass, 12 to 14 dkgrm.; clear turpentine, 7 to 8 dkgrm.; alcohol, 97 to 98 dkgrm.

Essence Varnish (Spanish).—Varnish for pictures: Pure mastic, 360 grm.; turpentine, 45 grm.; camphor, 15 grm.; powdered glass, 150 grm.; spirits of turpentine, 1,100 grm.

Etching Varnish.—Take of white wax, 2 oz.; black and Burgundy pitch, each ½ oz. Melt together, adding by degrees 2 oz. powdered asphaltum. Boil until a drop taken out on a plate will break when cold. Pour into warm water, and make into small balls for use.

Soft Varnish for Etchings.—Take linseed oil, 4 oz.; gum benzoin and white wax, ½ oz. each. Boil to two-thirds.

Ether Varnish.—Take 1 oz. of amber-colored copal, finely powdered, and place it in a flask containing 4 oz. ether; cork the flask with a glass stopper, and shake it for half an hour. Let it rest until the liquor becomes perfectly clear.

Fatty Varnish, for Painters.—Sandarac, 120 grm.; mastic, 30 grm.; Venetian turpentine, 6 grm.; boiled linseed oil or poppy oil, 750 grm.; spirits of turpentine, 90 grm.

Glass, Varnish for.—1. Terquem prepares a varnish for glass, on which drawings can be made either with Indian ink or ordinary ink. Four parts of gum mastic and 8 parts of sandarac are placed in a well-closed bottle with 8 parts of 95 per cent. alcohol, warmed in a water bath and then filtered. When used, the glass is heated to from 122° to 140°, and the varnish poured over it. After drawing is done, it is covered with a weak solution of gum. The varnish is very hard, and on warm glass it is brilliant and transparent, but when cold it is opaque, and absorbs the ink. It can be employed for putting labels on glass bottles, etc. A thin solution of gelatine applied to a plate of glass which is supported horizontally till dry, makes a good surface for pen-and-ink drawings for transparencies.

2. Reduce a quantity of gum tragacanth to powder, let it dissolve for twenty-four hours in the white of eggs well beaten up; rub it gently on the glass with a brush.

Gold Varnish.—1. Amber, 240 to 250 grm.; lac, 60 grm.; boiled linseed oil, 240 to 250 grm.; spirits of turpentine, 480 to 490 grm.

2. A permanent gold varnish, says a writer in *The Furniture Gazette,* which does not lose its color by exposure to air and light, may be prepared in the following manner: Two oz. of the best garancine or artificial alizarine are digested in a glass vessel with 6 oz. alcohol of specific gravity 0:883 for twelve hours, pressed and filtered. A solution of clear orange-colored shellac in similar alcohol is also prepared, filtered, and evaported until the lac has the consistence of a clear sirup; it is then colored with the tincture of garancine. Objects coated with this have a color which differs from that of gold only by a slight brownish tinge. The color may be more closely assimilated to that of gold by the addition of tincture of saffron.

3. Gold Varnish for Leather.—Take 18 oz. of white resin, 10 oz. of common resin, 8 oz. of aloes, in pieces, and put in an earthen vessel over a strong fire without flame, stir, and when dissolved, add 2 pt. linseed oil, and boil gradually for six hours. For a deeper shade, add, while boiling, 1 oz. of red lead, or according to the color required. Try it by taking a little on a stick; if it draws out in strings, it is done.

To add to the luster, gild the work with silver leaf before applying it.

Furniture, Rubbing Varnish for.—Sandarac, 250 grm.; mastic, 26 grm.; sarcocolla, 25 grm.; Venetian turpentine, 30 grm.; benzoin, 8 grm.; alcohol, 500 grm. The sarcocolla is extracted from different shrubs comprised in the species of the same name, which grow principally in Senegal and the Cape of Good Hope.

Insulating Varnishes.—For earth cables and exposed strong current wires:

1. Melt 2 parts of asphalt together with 0.4 part of sulphur, add 5 parts of linseed oil varnish, linseed oil or cotton seed oil, keep at 160° C. for 6 hours: next pour in oil of turpentine, as required.

2. Mix 3 parts of elaterite with 2 parts of linseed oil varnish at 200° C. for 5 to 6 hours, next melt 3 parts of asphalt, pour both substances together and again maintain the temperature of 200° C. for 3 to 4 hours, and then add 1 part of linseed oil varnish and oil of turpentine, as required.

Insulating varnish for dynamos and conduits with low tension:

1. Shellac, 4 parts; sandarac, 2 parts; linoleic acid, 2 parts; alcohol, 15 parts.

2. Shellac, 4 parts; sandarac, 4 parts; elemi, 1 part; alcohol, 20 parts.—*Farben Zeitung.*

Iron, Varnish for.—Melted colophony, 12 dkgrm.; sandarac, 18 dkgrm.; spirits of turpentine, 12 dkgrm. When this is all dissolved add: Distilled alcohol, 18 grm. This varnish is an excellent preservative from oxidation.

Leather Varnish.—Venice turpentine, 3 oz.; alcohol, 8 oz.; nigrosin, 30 grn.; aniline blue, 8 grn. Dissolve the aniline colors in a little alcohol before adding to the other ingredients.

Mordant Varnish.—Take 1 oz. mastic, 1 oz. sandarac, ½ oz. gum gamboge, and ¼ oz. turpentine; dissolve in 6 oz. spirits of turpentine. Or, place a quantity of boiled oil in a pan, and subject it to a strong heat. When a black smoke arises, set it on fire, and in a few moments extinguish it by covering over the pan; then pour the whole, while heated, into a bottle previously warmed, adding to it a little oil of turpentine.

Photographers, Varnish for.—M. Dumas recommends, in order to prevent the deterioration of photographic drawings, that a boiling solution of 1 part of dextrine in 5 parts of water should be poured upon the plates, which will deposit a thin coat of varnish sufficient to effect the desired object.

Plaster Casts, Varnish for.—Take ½ oz. of tin, together with the same quantity of bismuth, and fuse in a crucible. When perfectly dissolved, add ½ oz. of mercury. This substance, when mixed with the white of egg, forms a beautiful varnish for plaster casts.

Prints, to Varnish.—Dissolve 1 oz. of the best isinglass, or London single size, in 1 pt. of hot water by boiling, strain it fine and keep it for use. Add or diminish the isinglass or size till it merely dulls the surface. Give the print two or three coats with a flat camel's hair brush, letting it dry between each; then with best mastic varnish, give it two coats.

Spirit Varnish.—Shellac, 2 lb.; sandarac, ¼ lb.; gum thus, 6 oz.; alcohol, 1 gal. Dissolve and strain.

Tissue Paper, etc., Varnish for.—Add 2 parts of drying linseed oil to 1 of the solution of India rubber, and mix them by means of heat. Apply warm on both sides of the paper.

Transfer Varnish for Engravers.—Take 6½ oz. mastic in tears, 12½ oz. resin, and of genuine pale Venice turpentine and sandarac of each 25 oz. Dissolve, add 1 qt. turpentine varnish, agitate well and strain.

Transparencies, Varnish for.—Dissolve wax in oil of turpentine.

Varnish for Rosewood, etc.—Put together in a tin can, 1 gal, rectified alcohol, 12 oz. mastic and 1 pt. turpentine varnish, and keep them in a very warm place, shaking them now and then until they are perfectly dissolved; strain, and the mixture is fit for use. If necessary, dilute with turpentine varnish.

Varnish for Unpainted Work.—Quarter of a pt. of wood naphtha, ¼ pt. alcohol, 4 oz. benzoin, 4 oz. orange shellac; dissolve all together.

Waterproof Varnish for Boots.—1. Ozokerite (hard paraffine), 1 part: castor oil, 2 parts: lampblack, 1 part. Mix. 2. Salad oil, 1 pt.: mutton suet, 4 oz.: white wax and spermaceti, of each 1 oz. Melt together and apply to the boots warmed. 3. Spermaceti, 3 oz.; melt and add India rubber in thin shavings, ¾ oz.; when dissolved add tallow, 8 oz.: lard, 2 oz.; amber varnish, 4 oz. Mix well, and while still warm apply with a brush.

Waterproof Varnish for Leather, Carriage Tops, etc.—Eight oz. olive oil, 1 oz. ivory black, 1 oz. beeswax: dissolve in 4 oz. turpentine, mix together and apply when required.

White Shellac Varnish.—Dissolve 1 part pearlash in about 8 parts water: add 1 part shellac, and heat the whole to the boiling point. When the lac is dissolved, cool the solution, and saturate it with chlorine until the lac has all settled. When it is dissolved in alcohol, it forms a varnish which is transparent as any copal varnish. —*Fortsch. der Zeit.*

White Varnish, susceptible to polish for jambs, lintels, etc.: Mastic in drops, 12 to 13 dkgrm.; sandarac, 48 to 49 dkgrm.; elemi, 6 dkgrm.; Venetian turpentine, 2 l.; alcohol, 2.

Wood, Varnish for.—Linseed oil, 75 dkgrm.: amber, 50 dkgrm.: pulverized litharge, 16 dkgrm.: pulverized red lead, 92 dkgrm. This varnish, well applied, resists the action of boiling water.

Writing Varnish, Imperishable.—Take oil of French lavender, ½ oz.; gum copal, in powder, 30 grn.; lampblack, 5 grn.; place these materials together in a phial, which then put into scalding water. In a short time the copal will melt, and, if agitated, the whole will form one uniform fluid, which can be used for writing with a camel's hair pencil. This composition is very useful for writing the labels on bottles or jars containing strong acids or other corroding substances: also for gardeners' flower labels, as it is in nowise influenced by water: likewise for marking jars containing preserves, as well as for damp cellar stock.

Velvet, to Raise the Pile of.—A good method to raise damaged and pinched pile up again is as follows: Cover a hot iron with a wet cloth, lay the velvet or plush over it and beat carefully with a clothes brush. Lay the stuff on a smooth place and do not touch until it is quite dry.—*Leipziger Färber Zeitung.*

Vinegar, Clarifying.—The Era Formulary gives the following formula for a "clearing powder" suitable for vinegars, wines, liquors, etc.: Albumen, 3 lb.; neutral tartrate of potassium, 4-5 oz.; alum, ½ lb.; ammonium muriate, 7 lb.

The powder must not be added direct to the liquid to be cleared, but should first

be mixed with soft water. About 20 grn. of this powder are said to be sufficient for clearing a gallon of fluid.

Wall Paper, to Clean. See **Cleansing.**

Wash Blue Tablets. See **Bluing.**

Washing Powder.—A German soap journal gives the following processes: Figged (soft) soap, 25 lb.; linseed oil soap, 20 lb.; soda ash, 65 to 70 lb.

The above are crutched together, whereby the mixture becomes heated; the mass is then turned with a spade at short intervals until it disintegrates in small pieces. After cooling it is rubbed through a fine sieve and the powder is then ready to be packed. This process is recommended for small businesses, as it requires no mill to be used.

For large quantities the boiling process is better adapted, but it requires the use of a mill. Here is the formula: Red oil, 350 lb.; soda lye, 40° B, 140 lb.; soda ash, 70 lb.; water, 280 lb.

After saponifying the above and shutting off the heat, add 350 lb. soda ash by constant crutching. By continuing the crutching a gritty mass is obtained, which is run into a wooden, tin-lined box about 12 in. high, and there still crutched till cold. Recently soap powder has been brought on the market with an odor of ammonia, turpentine, and sometimes also perfumed. These ingredients may be incorporated while stirring in the box. On cooling, the now very solid mass must be ground in the mill and sifted. Powder carefully made in this way, it is said, does not expand while stored, and the bursting of the packages is not to be feared.

A cheaper powder is made by the same process from the following: Palm kernel oil, 135 lb.; palm oil, 20 lb.; soda lye, 40° B, 100 lb.; water, 800 lb.; to which are added soda ash, 1,050 lb.

Gathmann (American soaps) says that washing powders, usually sold to the consumer as soap powders, may be described in a general way as mixtures of powdered soap with about its own weight, more or less, of carbonate of soda. Some special brands are made which, in addition, contain other detergent agents, such as carbonate of ammonia, sal ammoniac or borax, while still others are found to which filling, in the form of talc, silex, etc., has been added. The soap itself may have been made by any of the processes known—cold, half boiled, or boiled, settled or boiled down—and the stock used may have been any fat; or mixture of fats, according to the grade of the washing powder to be made. It is thus seen that beyond being either principally or entirely a mixture of soap and soda, these powders have little in common with each other. Here are some typical formulas:

Borax Soap Powder.—Curd (hard) soap, in powder, 5 parts; soda ash, 3 parts; silicate soda, 2 parts; borax, 1 part.

Each ingredient is thoroughly dried and all mixed by sieving.

London Soap Powder.—Yellow soap, 6 parts; soda crystals, 3 parts; pearl ash, 1½ parts; sulphate of soda, 1½ parts; palm oil, 1 part.

These ingredients are combined as well as possible without any water, and they are spread out to dry, and then ground into coarse powder. They are adapted to hard waters, as their excess of carbonated alkali neutralizes the lime in the water.

Pearl Soap Powder.—Curd soap (powdered), 4 parts; sal soda (crude sodium carbonate), 3 parts; sodium silicate, 2 parts.

Dried as much as possible and intimately mixed.—*Pharm. Era.*

Waterproofing.—*Boots.*—1. One part ozokerit in 2 parts castor oil, and 1 part lampblack added, makes an excellent application, as the boots will take a thin polish after.

2. Salad oil, 1 pt.; mutton suet, 4 oz.; white wax and spermaceti, of each 1 oz.; melted together and applied to the boots warmed before the fire.

3. Much used by fishermen: Melt 3 oz. spermaceti in a ladle, and add ¾ oz. rubber, cut into thin shavings. When dissolved, add ½ lb. tallow, 2 oz. pure lard, and 4 oz. amber varnish. Mix well, and while still warm apply with a brush, giving two or three coats. It leaves a good polish, and is preservative as well as being waterproof.

Canvas.—The canvas is coated with a mixture of three solutions named below:

1. Gelatine, 50 grm., boiled in 3 l. of water free from lime. 2. Alum, 100 grm., dissolved in 3 l. of water. 3. Soda soap dissolved in 2 l. of water.—*Suddeutsche Apotheker Zeitung.*

Paper, Waterproof.—Is produced by Paul Dresen, according to a French patent, in the following manner: Mix 28 parts of ordinary olive oil, 28 parts of rapeseed oil, and 28 parts of linseed oil, and add to the mixture a solution of 8 parts of wax in 8 parts of oil of turpentine. This mixture is applied on the paper on one side or both sides by hand or in machine. The paper thus prepared is said to remain waterproof longer than the waterproof paper now in the market.—*Dampf.*

Walls, Waterproof Coating for.—The following coating has proved very effective in preventing the penetration of moisture on the weather side of walls: Pitch, 50 lb.; resin, 30 lb.; red ocher, 6 lb.; fine brick dust, 12 lb.; all boiled together with constant stirring, and then sufficient oil of turpentine—about ¼ the volume of the above—added, to cause it to spread readily. It should be laid on as thin as possible with a bristle brush.

Waterproof Cloth.—These methods may be divided into two groups. In some, a precipitate of salts of the fatty acids is produced upon the tissue itself; in others, the cloth is saturated with melted or dissolved substances, which, when they are once solidified on the fiber, have the property of repelling water. If any of the former class methods is selected, the cloth is passed into a special machine, in which it is saturated with aluminum acetate; it is dried and passed into a soap beck. It is necessary in this operation to produce a basic compound. For this purpose, there are employed equal weights of salts of aluminum and lead. Care must be taken not to introduce too large quantities of free acid with the aluminum sulphate, since the latter contains always a certain quantity of sulphuric acid, which, during desiccation, displaces the acetic acid. To avoid this inconvenience, there are added per liter from 10 to 80 grm. soda. The most favorable temperature is 50°. Heating by direct steam *must* be avoided. For preparing the soap bath the author utilizes the fact that an aqueous solution of soap forms true solutions with mixtures of fat and wax, resins, mineral oils, and even caoutchouc. To this end take a 10 per cent. solution of gum Paraguay in oil of turpentine. The proportions to be employed for a square meter of cloth are 30 grm. tallow soap, 25 grm. Japan wax, 1·5 grm. gum Paraguay, 1 grm. good varnish. The wax is first melted, the gum and the varn-

ish are added, and then for each k. of the solid gum there are added 0·5 grm. of a solution, saturated in heat of potassium sulphide (liver of sulphur). The mixture is stirred and boiled, when sulphureted hydrogen is liberated. A boiling solution of soap is added, when the bath is fit for use.—*Em. Doring, in Romen's Journal.*

Wood, Waterproof and Fireproof.—In order to render wood waterproof and fireproof, the following "silicification" process is made use of according to the *Gewerbe*. The small boards are first laid into a water-glass solution of 5° to 10° Bé., where they are left 10 to 12 hours, when they are taken out and allowed to drip off. After drying, they are placed in a solution (gravity 2° to 3° Bé.) of calcium chloride, magnesium chloride and ammonium chloride. In this they are left 4 to 6 hours, and after dripping off and drying again, they are ready for use.

Wax.—*Floor.*—Yellow wax dissolved in turpentine is one of the simplest forms of floor wax, and by many accounted the most satisfactory of all. A typical formula is the following:

Yellow wax	1 part.
Oil of turpentine	2½ "

Dissolve the wax in the oil by the heat of a water bath. Apply the mixture to the floor by means of a brush and after one or two hours, rub with a woolen cloth until polished. Combinations of soap, wax, and turpentine with caustic potash are used largely. These may be put up by druggists for retailing. The following are typical formulas:

No. 1.

Yellow wax	250 parts.
Water	580 "
Potash	35 "
Hard soap	74 "
Oil of turpentine	660 "

The wax is added in thin shavings to 280 parts of water contained in a suitable vessel and heat is applied until it melts; then add the turpentine. Dissolve the potash and soap in 300 parts of water, and add the solution thus formed to the hot mixture of wax, turpentine, and water; then stir until cold.

No. 2.

Potash	32 parts.
Water	314 "
Yellow wax	32 "
Annatto	8 "

Dissolve the potash in the water, heat to boiling and add the wax, and finally the annatto to color.

No. 3.

Yellow wax	1 part.
Kerosene	8 "

Dissolve the wax in the kerosene over a hot plate (not over open fire). The mixture while hot is spread on the floor in a thin layer. A thin layer of wax remains after the kerosene evaporates and this is rubbed lightly with a cloth until the desired polish is obtained.—*American Druggist.*

Hardening of Wax.—Tallow will not harden. Use resin with wax; 10 to 20 parts will make it much harder and fairly tough.

Wax, Milk of.—Melt in a porcelain capsule a certain quantity of white wax, and add to it while in fusion an equal quantity of spirits of wine, of sp. gr. 0.830. Stir the mixture, and pour it upon a large porphyry slab. The granular mass is to be converted into a paste by the muller, with the addition from time to time of a little alcohol. As soon as it appears to be smooth and homogeneous, water is to be introduced, in small quantities, successively, to the amount of four times the weight of the wax. Strain through canvas.

Wax Sheets, to Make.—I have used the following plan for the last fifteen years: After the wax is properly cleaned, get four pieces of glass cut the width you want to have your sheets and about ten inches long. Any deep vessel, such as a dinner pail or an old oyster can, will serve to melt the wax. Put the pieces of glass in a pail of cold water; when the wax is melted, take two pieces of the glass, one in each hand, and dip alternately, one cooling while you dip the other (about three or four dips is sufficient), then drop into the cold water. Let these two remain till you dip the other two in the same manner. By trimming the edges off the glass with a knife, the sheets will drop off themselves. If the wax is kept too hot, the sheets will be too thin: if too cold, they will be lumpy and thick. Near the setting or cooling point is the proper temperature. A tablespoonful of Venice turpentine to three or four pounds of wax will toughen it. This should be evaporated to dryness like resin. It can sometimes be obtained in drug stores in this form. It will answer the purpose even if used thin, but the thicker it is the tougher will be the wax sheets.—*Dr. Beacock, Dom. Dent. Jour.*

Whalebone Substitute. See **Balenite.**

Wine Essence, Artificial.—The following have been published as suitable for flavoring purposes:

Essence of Sherry.—Oenanthic ether, 1 oz.; nitrous ether, 2 oz.; rectified spirit to 1 pt.

Essence of Port.—Acetic ether, 1 oz.; essence of grape, 4 oz.; essence of vanilla, 4 oz.; tincture of kino, 4 oz.; essence raspberry, 8 oz.

Essence of Port.—Butyric ether, 2 oz.; acetic ether, 1 oz.; amyl acetate, 1½ drm.; essence vanilla, 1½ oz.; tincture orris, 2 oz.; rectified spirit to 1 pt.

Brandy Essence.—Oil of prunes, 2 oz.; butyric ether, 1 drm.; oil of cognac, 4 drm.; wine ether, 1 oz.; alcohol, 4 oz.

Essence of Gin.—Oil juniper, 1 oz.; oil nutmeg, 1 drm.; oil caraway, 6 min.; fusel oil, 10 min.; rectified spirit, 16 oz.

Madeira Wine Essence.—Nitrous ether, 1 oz.; oenanthic ether, 4 oz.; cocinic ether, 2 oz.; wine ether, 1 oz.; tincture vanilla, 4 oz.; rectified spirit to 1 pt.

Claret Wine Essence.—Oenanthic ether, 4 oz.; nitrous ether, 1 oz.; acetic ether, 5 oz.; wine ether, 2 oz.; rectified spirit, 4 oz.—*Pharmaceutical Era.*

Clarification of Wines.—If the wine is not clear and bright after racking, it is necessary to clarify it. There are many causes which interfere with the proper brightness of wine, such as changes of temperature, in careless racking, and others. Some wines clear themselves, so that clarification need not be resorted to. A great many different substances have been employed in clarification. Many of the so-called clarifying powders are nothing but dried blood albumin. Isinglass or fish glue is one of the best agents for clarification. It is dissolved in water until little more fluid than molasses. Gelatine prepared from bone is also used and may be obtained in sheets or in small pieces and sometimes in tablets. It is one of the best agents that can be used in clarifying, and is especially valuable for clarifying white wine. After wine has been clarified with the gelatine it should be racked after standing a short time. Blood albumin affords a cheap and efficient means of clarifying the wine in large quantities. A gallon of blood beaten up with a gallon of the same

kind of wine which it is desired to clarify will clarify 200 gallons of wine. Great care should be taken to have the blood fresh, as otherwise it is sure to injure, if not entirely destroy, the wine. It is especially successful in clarifying new wine. In case the wine loses a portion of its color, it can be readily restored by an addition of the usual coloring matters.

Milk is used to some extent in place of the blood, but it is not as reliable. If the wine is of great value, the whites of eggs afford the best means of clarifying it, and should be used in all cases where expense is not an object. No pains should be spared to see that the eggs are entirely fresh, as otherwise the wines would be destroyed. The whites of the eggs are particularly efficient for white wine. The proper proportion is 1 egg per 10 gal. They should be beaten up with a small portion of wine with an egg-beater, before adding to the wine. Gum arabic is also used, but is not as good as the white of egg or blood. Salt, alcohol and tannin, and many other substitutes have been used with varying success. The ones already mentioned will give the best satisfaction.

Yellow White Wines.—The yellow color of white wines frequently stands in the way of their ready sale. It is removed by the blood albumin receipt given under clarification above. The receipt given under clarification of wines can also be used to bring white wine which has turned yellow back to its normal color.

Earthy Flavor of Wines.—This defect in wines is apt to interfere seriously with their sale, as the taste is particularly disagreeable. It may be the result of several causes. The vineyards may not be properly cared for, or in low, wet land. The treatment of wines which have the earthy flavor requires much judgment and experience. Wines should be promptly clarified by the means already given, and frequently racked. The white of egg receipt given under clarification is the best one to use for this defect. The addition of a small quantity of tannin dissolved in alcohol will also help to correct this defect.

Greenness.—This defect gives a very sour, unpleasant taste to the wine, owing to the malic and tartaric acids, which are in excess. There is no ordinary defect of wine which is more noticeable and more disagreeable than greenness. As its name implies, it is frequently caused by the use of unripe grapes. The treatment of the wine must be varied according to the taste. One of the various methods is to add from 1 to 3 qt. of old brandy to every 100 gal. of wine. Potassium tartrate affords a cheap and easy method of neutralizing the tartaric acid, forming potassium bitartrate, which may be afterward removed, when the wine is right. The amount of potassium tartrate which may be used varies with the sourness of the wine, but 18 oz. per 100 gal. would be considered an average amount. Various other substitutes have been tried, but none are as successful as potassium tartrate.

Woods, Strength of.—The strength of different woods to resist a compressive strain depends upon the value of the absolute force or weight which has been found by experiment to crush them, and which has a very wide range. The annexed table shows the crushing weight for all the woods which are used in the various branches of constructive art, and from these numbers and simple rules it will be easy to calculate the strength of pillars of different lengths and sizes.

Description of Timber.	Crushing Weight in cwts. per square inch.	Safe Load in cwts. per square inch.	Timber, where Grown.
Alder	61·50	15·40	England.
Ash	80	20	"
Birch	104	26	America.
Beech	83	21	"
Box	92	23	"
Elm	92	23	"
Ebony	170	42·25	West Indies.
Hornbeam	65	16·25	America.
Larch	50	12·50	England.
Mahogany	73	18·25	Honduras.
Oak	89·25	22·25	England.
"	53·50	13·40	Canada.
"	68·75	17·20	Dantzig.
Pine (Red)	51·75	13	America.
Pine	48	12	The Baltic.
Sycamore	63·45	15·80	England.
Spruce	61	15·25	America.
Teak	108	27	Africa.
Watergum	90	22·50	East Indies.

Workshops, to Lessen Noise in.—In workshops of several stories it is sometimes desirable to check the noise transmitted through the floors to the apartments below: this may be done by the use of rubber cushions under the legs of the work bench, or of kegs of sand or sawdust applied in the same way. A few inches of sand or sawdust is, as described by a contemporary, first poured into each keg: on this is laid a board or block upon which the leg rests and around the leg and block is poured fine dry sand or sawdust. Noise and shock are prevented: and an ordinary anvil so mounted may be used in a dwelling house without annoying the inhabitants.

Tables of Weights and Measures.

The following tables give the principal standards of weights and measures. The tables are arranged and numbered as follows. Abreviations are given thus (lb.).

1. Measure of Length (Lineal Measure).
2. Geographical and Nautical Measure.
3. Land Measure (Lineal).
4. Land Measure (Square).
5. Dry Measure (English).
6. Dry Measure (U. S.).
7. Table of Decimal Equivalent.
8. Cubic Measure.
9. Old Wine and Spirit Measure.
10. Liquid Measure (U. S.).
11. Apothecaries' Liquid Measure.
12-13. Avoirdupois Weight.
14. Apothecaries' Weight.
15. Troy Weight.
16. Relative Proportions of Weight.
17. Diamond Weight.
18-31. Metric Weights and Measures.
32-34. Household and Miscellaneous Tables.
35. Tables of Electrical Horse Power.
36-39. Tables Relating to Wire.
40-41. Comparison of Specific Gravity and Baumé's Hydrometer.

1. *Measures of Length.—Lineal Measure.—*

3 barleycorns, or	1 inch (in.)
12 lines, or	
72 points, or	
1,000 mils (mi.)	
3 inches	1 palm.
4 inches	1 hand.
9 inches	1 span.
12 inches	1 foot (ft.)
18 inches	1 cubit.
3 feet	1 yard (yd.)
2½ feet	1 military pace
5 feet	1 geometrical pace.
2 yards	1 fathom.
5½ yards	1 rod, pole or perch.
40 poles, or	1 furlong (fur.)
220 yards	
8 furlongs, or	1 mile.
1,760 yards, or	
5,280 feet	
3 miles	1 league.
2,240 yards, or	1 Irish mile.
1·272 miles	

The inch is also divided into halves, quarters, eighths, and sixteenths; sometimes into tenths. The hand is used to measure horses' height. The military pace is the length of the ordinary step of a man. Geometrical pace is the length of two steps. 1,000 of such paces were reckoned to a mile. The fathom is used in soundings to ascertain depth and for measuring cordage and chains.

2. Geographical and Nautical Measure.—

6086·44	feet, or	= 1 nautical mile or knot.
1000	fathoms, or	
10	cables, or	
1·1528	statute miles	
60	nautical mi., or	= 1 degree.
67·168	statute miles	
360	degrees	= 1 circumference [of the earth at the equator.

Estimating a mile at 6139¼ ft., and using a 30 second glass. If a 28 second glass is used, and 8 divisions, then

1 knot = 47 ft. 8 + in.
1 fathom = 5 ft. 11⅝ + in.

The line should be about 150 fathoms long, having 10 fathoms between the chip and first knot for stray line.

Note.—Bowditch gives 6,120 ft. in a sea mile which, if taken as the length, will make the divisions 51 ft. and 5 $\frac{1}{10}$ ft.

1 league = 3 nautical miles.
1 cable's length = 120 fathoms.

3. *Land Measure (Lineal).*

7·92 inches	1 link.
100 links, or	1 chain (ch.)
66 ft., or	
22 yds., or	
4 poles	
10 chains	1 furlong (fur.)
80 chains, or	1 mile.
8 furlongs	

4. Land Measure (Square).

144 sq. in.	1 square foot (sq. ft.)
9 sq. ft.	1 square yard (sq. yd.)
30¼ sq. yds.	1 sq. pole, rod or perch.
16 sq. poles	1 square chain (sq. ch.)
40 sq. poles, or	1 sq. rood.
1,210 sq. yds.	
4 roods, or	1 acre.*
10 sq. chains, or	
160 sq. poles, or	
4,840 sq. yds., or	
43,560 sq. ft	
640 acres, or	1 sq. mile.
3,097,600 sq. yds.	
30 acres	1 yd. of land.
100 acres	1 hide of land.
40 hides	1 barony.

*The side of a square having an area of an acre is equal to 69·57 lineal yards.

5. *Dry Measure (English).*

		Cu. in.
2 pints	1 quart (qt.)	67·20
4 quarts	1 gallon (gal.)	268·80
2 gallons	1 peck (pk.)	537·60
4 pecks, or 8 gallons	1 bushel (bu.)	2150·42
2 bushels	1 strike,	4300·84
4 bushels	1 coomb,	8601·68
5 bushels	1 sack,	10752·10
8 bushels	1 quarter (qr.)	17203·36
4 quarters (41·077 cubic feet)	1 chaldron.	
5 quarters	1 wey or load.	
2 loads	1 last.	

The standard bushel is 18½ inches in diameter inside and 8¼ inches deep; it holds 80 pounds of distilled water at 60° F. It is 19½ inches in diameter outside. This measure is applied to dry goods, as corn, seeds, roots, etc., which are struck with a straight bar. The old dry measures had the same denominations and proportions, and were 96·95% of the imperial dry measures above given. The heaped imperial bushel must be an upright cylinder of which the diameter is not less than twice its depth, and the height of the conical heap must be at least ¾ of the depth of the bushel, the outside of the measure being the boundary of the base of the cone. It may be 18·789 inches in diameter inside and 8 inches deep, and the capacity, heaped, must be 1·6293 cubic feet. Heaped measure is used for such goods as cannot be conveniently stricken, as coal, fruit and potatoes.

A load of hay contains 36 trusses.
A chaldron = 36 bushels or 57·24 cubic feet.
A perch of stone = 24·75 cubic feet.
A cord of wood contains 128 cubic feet.

6. *Dry Measure, U. S.*—

		Cu. in.
2 pints	1 quart (qt.) =	67·20
4 quarts	1 gallon (gal.) =	268·80
2 gallons or 8 quarts	1 peck =	537·60
4 pecks	1 struck bushel =	2150·42

7. *Table of Decimal Equivalents.* – Of 8ths, 16ths, 32ds, and 64ths of an inch.

1/64 = ·015625	11/32 = ·34375	43/64 = ·671875
1/32 = ·03125	23/64 = ·359375	11/16 = ·6875
3/64 = ·046875	1/2 = ·375	45/64 = ·703125
1/16 = ·0625	25/64 = ·390625	23/32 = ·71875
5/64 = ·078125	13/32 = ·40625	47/64 = ·734375
3/32 = ·09375	27/64 = ·421875	3/4 = ·75
7/64 = ·109375	7/16 = ·4375	49/64 = ·765625
1/8 = ·125	29/64 = ·453125	25/32 = ·78125
9/64 = ·140625	15/32 = ·46875	51/64 = ·796875
5/32 = ·15625	31/64 = ·484375	13/16 = ·8125
11/64 = ·171875	1/2 = ·50	53/64 = ·828125
3/16 = ·1875	33/64 = ·515625	27/32 = ·84375
13/64 = ·203125	17/32 = ·53125	55/64 = ·859375
7/32 = ·21875	35/64 = ·546875	7/8 = ·875
15/64 = ·234375	9/16 = ·5625	57/64 = ·890625
1/4 = ·25	37/64 = ·578125	29/32 = ·90625
17/64 = ·265625	19/32 = ·59375	59/64 = ·921875
9/32 = ·28125	39/64 = ·609475	61/64 = ·9375
19/64 = ·296875	5/8 = ·625	31/32 = ·953125
5/16 = ·3125	41/64 = ·640625	63/64 = ·96875
21/64 = ·328125	21/32 = ·65625	1 = ·984375

8. *Cubic Measure.*—

1,728 cubic inches = 1 cubic foot.
27 cubic feet = 1 cubic or solid yard.

9. *Old Wine and Spirit Measure.*—

		Imperial Gals.
4 gills or quaterns	1 pint.	
2 pints	1 quart.	
4 quarts (231 cu. in.)	1 gallon	= ·8333
10 gallons	1 anchor	= 8·333
18 gallons	1 bunlet	= 15
31½ gallons	1 barrel	= 26·25
42 gallons	1 tierce	= 35
63 gallons, or 2 barrels	1 hogsh'd	= 52·5
84 gallons, or 1½ hogsheads	1 punch'n	= 70
126 gallons, or 2 hogsheads, or 1½ puncheons	1 pipe or butt	= 105
2 pipes, or 3 puncheons	1 tun	= 210

10. *Liquid Measure (U. S.).*

		Cu. in.
4 gills	1 pint (O.)	= 28·875
2 pints	1 quart (qt.)	= 57·75
4 quarts	1 gallon (gal.)	= 231·
63 gallons	1 hogshead (hhd.)	
2 hogsheads	1 pipe or butt.	
2 pipes	1 tun.	

11. Apothecaries' Liquid Measure.—

Apothecaries' or Wine Measure is the officinal or standard system in use by the pharmacists of this country. Its denominations are gallon, pint, fluid ounce, fluid drachm and minim, and the signs used to express them and their relative value are as follows:

Cong.	O	F. Oz.	F. Dr.	Minims.
1 =	8 =	128 =	1,024 =	61,440
	1 =	16 =	128 =	7,680
		1 =	8 =	480
			1 =	60
				1

The Imperial Standard Measure is the system in use by British pharmacists. Its denominations and their relative value are:

Gal.	Quarts.	Pints.	F. Oz.	F. D.	Minims.
1 =	4 =	8 =	160 =	1280 =	76 800
	1 =	2 =	40 =	320 =	19,200
		1 =	20 =	160 =	9,600
			1 =	8 =	480
				1 =	60

The relative value of United States Apothecaries' and British Imperial Measure is as follows:

U. S. Apothecaries' Measure.	Imperial Measure. Pts.	F. oz.	F. dr.	Drop.
1 Gallon =	·83311 Gallon, or 6	16	2	22·85
1 Pint =	·83311 Pint, or	16	5	17·86
1 Fl. Oz. =	1·04139 Fl. Oz., or	1	0	19·76
1 Fl. Dr. =	1·04139 Fl. Dr., or		1	2·48
1 Minim =	1·04139 Minim, or			1·04

12. *Avoirdupois Weight.*—Avoirdupois weight is used for weighing all goods except those for which troy and apothecaries' weight are employed, and for compounding recipes for domestic purposes and for the arts. Its denominations and their relative values are—

Ton.	Cwt.	Qrs.	Lb.	Ozs.	Drs.
1 =	20 =	80 =	2,240 =	35,840 =	573,440
	1 =	4 =	112 =	1,792 =	28,672
		1 =	28 =	448 =	7,168
			1 =	16 =	256
				1 =	16

13. An additional table of avoirdupois weight is given below.

27·34 grains (grns.) = 1 drachm (drms.)
16 drachms = 1 ounce (oz.) 437½ grns.
16 ounces = 1 pound (lb.) 7,000 grns.
28 pounds = 1 quarter.
4 quarters = 1 hundredweight (cwt.)
20 hundredweight = 1 ton of 2240 lb.

A stone is equal to 14 lb.
A quintal is equal to 100 lb.

14. *Apothecaries' Weight.* — Apothecaries' weight is used by apothecaries in compounding medicines, and is the officinal standard of the United States Pharmacopœia. In buying and selling medicines not ordered by prescriptions avoirdupois weight is used. The denominations of apothecaries' weight and their relative values are –

Lb.	Oz.	Dr.	Scr.	Gr.
1 =	12 =	96 =	288 =	5760
	1 =	8 =	24 =	480
		1 =	3 =	60
			1 =	20

15. *Troy Weight.*—Is used by jewelers and at the mints, in the exchange of the precious metals. Its denominations and their relative values are:

Lb.	Oz.	Dwt.	Gr.
1 =	12 =	240 =	5760
	1 =	20 =	480
		1 =	24

7000 troy grains = 1 lb. avoirdupois.
175 troy pound = *144 lb. avoirdupois.*
175 troy ounces = *192 oz. avoirdupois.*
437½ troy grains = *1 oz. avoirdupois.*
1 troy pound = *·8228+ lb. avoirdupois.*

The common standard of weight by which the relative values of these systems are compared is the grain, which for this purpose may be regarded as the unit of weight. The pound troy and that of apothecaries' weight have each five thousand seven hundred and sixty grains; the pound avoirdupois has seven thousand grains.

16. Relative Proportions.—The relative proportions and values of these several systems are as follows:

Troy.	Avoirdupois. Oz.	Dr.
1 pound equals	13	2·65
1 ounce equals	1	1·55
1 dwt. equals	—	0·877

Troy.	Apothecaries'. Lb.	Oz.	Dr.	Scr.	Gr.
1 pound equals	1	0	0	0	0
1 ounce equals	0	1	0	0	0
1 dwt. equals	0	0	0	1	4
1 grain equals	0	0	0	0	1

Apothecaries'.	Avoirdupois. Oz.	Dr.
1 pound equals	13	2·65
1 ounce equals	1	1·55
1 drachm equals	6	2·19
1 scruple equals	0	0·73

Apothecaries'.	Troy. Lb.	Oz.	Dwt.	Gr.
1 pound equals	1	0	0	0
1 ounce equals	0	1	0	0
1 drachm equals	0	0	2	12
1 scruple equals	0	0	0	20

Avoirdupois.	Troy. Lb.	Oz.	Dwt.	Gr.
1 ton equals	2,922	2	13	8
1 cwt. equals	146	1	6	16
1 quarter equals	34	0	6	16
1 pound equals	1	2	11	16
1 ounce equals	—	0	18	$5\frac{1}{2}$
1 drachm equals	—	0	1	$3\frac{11}{32}$

Avoirdupois.	Apothecaries. Lb.	Oz.	Dr.	Scr.	Gr.
1 pound equals	1	2	4	2	0
1 ounce equals	0	0	7	0	$17\frac{1}{2}$
1 drachm equals	0	0	0	1	$7\frac{7}{32}$

17. Diamond.—

16 parts = 1 grain = 0·8 troy grain.
4 grains = 1 carat = 3·2 troy grains.

18. Decimal System.—Weights and Measures.—The metric system, formed on the meter as the unit of length, has four other leading units, all connected with and dependent upon this, viz., the *meter*, the unit of measure of length. The *are*, the unit of surface, and is the square of ten meters. The liter, the unit of capacity, and is the cube of a tenth part of the meter. The *stere*, the unit of solidity, having the capacity of a cubic meter. The *gramme*, the unit of weight, and is the weight of that quantity of distilled water at its maximum density which fills the cube of a hundredth part of the meter. Each unit has its decimal multiple and sub-multiple, that is, weights and measures ten times larger or ten times smaller than the principal unit. The prefixes denoting the multiples are derived from the Greek, and are *deka*, ten; *hecto*, hundred; *kilo*, thousand; and *myria*, ten thousand. Those denoting sub-multiples are taken from the Latin, and are *deci*, ten; *centi*, hundred; *milli*, thousand. The table given below embraces all the weights and measures of the system.

19. *Table for the Conversion of Mils* ($\frac{1}{1000}$ *in.*) *into Centimeters.*

Mils.	Centimeters	Mils.	Centimeters	Mils.	Centimeters	Mils.	Centimeters
1	0·00254	26	0·06602	51	0·1295	76	0·1930
2	0·00508	27	0·06856	52	0·1321	77	0·1956
3	0·00762	28	0·07110	53	0·1346	78	0·1981
4	0·01016	29	0·07364	54	0·1372	79	0·2006
5	0·01270	30	0·07618	55	0·1397	80	0·2032
6	0·01524	31	0·07872	56	0·1422	81	0·2057
7	0·01778	32	0·08126	57	0·1448	82	0·2083
8	0·02032	33	0·08380	58	0·1473	83	0·2108
9	0·02286	34	0·08634	59	0·1499	84	0·2133
10	0·02540	35	0·08888	60	0·1524	85	0·2159
11	0·02793	36	0·09142	61	0·1549	86	0·2184
12	0·03047	37	0·09396	62	0·1575	87	0·2209
13	0·03301	38	0·09650	63	0·1600	88	0·2235
14	0·03555	39	0·09904	64	0·1626	89	0·2260
15	0·03809	40	0·1016	65	0·1651	90	0·2286
16	0·04063	41	0·1041	66	0·1676	91	0·2311
17	0·04317	42	0·1067	67	0·1702	92	0·2336
18	0·04571	43	0·1092	68	0·1727	93	0·2362
19	0·04825	44	0·1118	69	0·1752	94	0·2387
20	0·05079	45	0·1143	70	0·1778	95	0·2413
21	0·05333	46	0·1168	71	0·1803	96	0·2438
22	0·05587	47	0·1194	72	0·1829	97	0·2465
23	0·05841	48	0·1219	73	0·1854	98	0·2489
24	0·06095	49	0·1245	74	0·1879	99	0·2514
25	0·06348	50	0·1270	75	0·1905	100	0·2540

United States Standard Weights and Measures.—The office of Weights and Measures, Washington, is the repository of the United States standards, comprising those based on the English system, called customary, as well as those representing the metric system of weights and measures. It has recently received from Paris the national meter and kilogramme prototypes—standards of such unrivaled perfection (excepting, of course, by their fellows) that a brief account of the circumstances attending their construction will prove of interest.

The necessity of having a common standard of length and weight led the principal governments of the world to establish by concurrent action an international bureau of weights and measures at Paris for the construction and preservation of standards. A treaty to this effect was signed at Paris in May, 1875. By this treaty the administrative direction of the bureau was put in the hands of eminent scientific men, who are delegated by their respective governments to supervise its operations. After an exhaustive study of the subject, involving experiments and delay, the theoretical requirements were agreed upon, and the bureau entered upon their practical execution. This

(Continued on page 86.)

Relative Value.	Length.	Surface.	Capacity.	Solidity.	Weight.
10,000	Myriameter				
1 000	Kilometer		Kiloliter		Kilogramme
100	Hectometer	Hectare	Hectoliter		Hectogramme
10	Dekameter		Dekaliter	Dekastere	Dekagramme
Unit	Meter	Are	Liter (l)	Stere	Gramme
0·1	Decimeter	Deciare	Deciliter	Decistere	Decigramme
0·01	Centimeter	Centiare	Centiliter		Centigramme
0·001	Millimeter		Milliliter		Milligramme

U. S. Standard Weights and Measures.

The following tables have been issued from the Office of Standard Weights and Measures, United States Coast and Geodetic Survey, T. C. Mendenhall, Superintendent.

Tables for Converting U. S. Weights and Measures—Customary to Metric.

20. Linear.

	Inches to millimeters.	Feet to meters.	Yards to meters.	Miles to kilometers.
1 =	25·4000	0·304801	0·914402	1·60935
2 =	50·8001	0·609601	1·828804	3·21869
3 =	76·2001	0·914402	2·743205	4·82804
4 =	101·6002	1·219202	3·657607	6·43739
5 =	127·0002	1·524003	4·572009	8·04674
6 =	152·4003	1·828804	5·486411	9·65608
7 =	177·8003	2·133604	6·400813	11·26543
8 =	203·2004	2·438405	7·315215	12·87478
9 =	228·6004	2·743205	8·229616	14·48412

21. Square.

	Square inches to square centimeters.	Square feet to square decimeters.	Square yards to square meters.	Acres to hectares
1 =	6·452	9·290	0·836	0·4047
2 =	12·903	18·581	1·672	0·8094
3 =	19·355	27·871	2·508	1·2141
4 =	25·807	37·161	3·344	1·6187
5 =	32·258	46·452	4·181	2·0234
6 =	38·710	55·742	5·017	2·4281
7 =	45·161	65·032	5·853	2·8328
8 =	51·613	74·323	6·689	3·2375
9 =	58·065	83·613	7·525	3·6422

22. Cubic.

	Cubic inches to cubic centimeters.	Cubic feet to cubic meters.	Cubic yards to cubic meters.	Bushels to hectoliters.
1 =	16·387	0·02832	0·765	0·35242
2 =	32·774	0·05663	1·529	0·70485
3 =	49·161	0·08495	2·294	1·05727
4 =	65·549	0·11327	3·058	1·40969
5 =	81·936	0·14158	3·823	1·76211
6 =	98·323	0·16990	4·587	2·11454
7 =	114·710	0·19822	5·352	2·46696
8 =	131·097	0·22654	6·116	2·81938
9 =	147·484	0·25485	6·881	3·17181

23. Capacity.

	Fluid drachms to milliliters or cubic centimeters.	Fluid ounces to milliliters.	Quarts to liters.	Gallons to liters.
1 =	3·70	29·57	0·94636	3·78544
2 =	7·39	59·15	1·89272	7·57088
3 =	11·09	88·72	2·83908	11·35632
4 =	14·79	118·30	3·78544	15·14176
5 =	18·48	147·87	4·73180	18·92720
6 =	22·18	177·44	5·67816	22·71264
7 =	25·88	207·02	6·62452	26·49808
8 =	29·57	236·59	7·57088	30·28352
9 =	33·28	266·16	8·51724	34·06896

24. Weight.

	Grains to milligrammes.	Avoirdupois ounces to grammes.	Avoirdupois pounds to kilogrammes.	Troy ounces to grammes.
1 =	64·7989	28·3495	0·45359	31·10348
2 =	129·5978	56·6991	0·90719	62·20696
3 =	194·5968	85·0486	1·36078	93·31044
4 =	259·1957	113·3981	1·81437	124·41392
5 =	323·9946	141·7476	2·26796	155·51740
6 =	388·7935	170·0972	2·72156	186·62089
7 =	453·5924	198·4467	3·17515	217·72437
8 =	518·3914	226·7962	3·62874	248·82785
9 =	583·1903	255·1457	4·08233	279·93133

25.

1 chain	=	20·1169 meters.
1 square mile	=	259 hectares.
1 fathom	=	1·829 meters.
1 nautical mile	=	1853·27 meters.
1 foot = 0·304801 meter,		9·4840158 log.
1 avoir. pound	=	453·5924277 grm.
15432·35639 grains	=	1 kilogramme.

The only authorized material standard of customary length is the Troughton scale belonging to this office, whose length at 59·62° Fahr. conforms to the British standard. The yard in use in the United States is therefore equal to the British yard.

The only authorized material standard of customary weight is the troy pound of the mint. It is of brass of unknown density, and therefore not suitable for a standard of mass. It was derived from the British standard troy pound of 1758 by direct comparison. The British avoidupois pound was also derived from the latter, and contains 7,000 grains troy.

The grain troy is therefore the same as the grain avoirdupois, and the pound avoirdupois in use in the United States is equal to the British pound avoirdupois.

The British gallon = 4·54346 liters.

The British bushel = 36·3477 liters.

Tables for Converting U. S. Weights and Measures—Metric to Customary.

26. Linear.

	Meters to inches.	Meters to feet.	Meters to yards.	Kilometers to miles.
1 =	39·3700	3·28083	1·093611	0·62137
2 =	78·7400	6·56167	2·187222	1·24274
3 =	118·1100	9·84250	3·280833	1·86411
4 =	157·4800	13·12333	4·374444	2·48548
5 =	196·8500	16·40417	5·468056	3·10685
6 =	236·2200	19·68500	6·561667	3·72822
7 =	275·5900	22·96583	7·655278	4·34959
8 =	314·9600	26·24667	8·748889	4·97096
9 =	354·3300	29·52750	9·842500	5·59233

27. Square.

	Square centimeters to square inches.	Square meters to square feet.	Square meters to square yards.	Hectares to acres.
1 =	0·1550	10·764	1·196	2·471
2 =	0·3100	21·528	2·392	4·942
3 =	0·4650	32·292	3·588	7·413
4 =	0·6200	43·055	4·784	9·884
5 =	0·7750	53·819	5·980	12·355
6 =	0·9300	64·583	7·176	14·826
7 =	1·0850	75·347	8·372	17·297
8 =	1·2400	86·111	9·568	19·768
9 =	1·3950	96·874	10·764	22·239

28. Cubic.

	Cubic centimeters to cubic inches.	Cubic decimeters to cubic inches.	Cubic meters to cubic feet.	Cubic meters to cubic yards.
1 =	0·0610	61·023	35·314	1·308
2 =	0·1220	122·047	70·629	2·616
3 =	0·1831	183·070	105·943	3·924
4 =	0·2441	244·093	141·258	5·232
5 =	0·3051	305·117	176·572	6·540
6 =	0·3661	366·140	211·887	7·848
7 =	0·4272	427·163	247·201	9·156
8 =	0·4882	488·187	282·516	10·464
9 =	0·5492	549·210	317·830	11·771

29. Capacity.

	Milliliters or cubic centiliters to fluid drachms.	Centiliters to fluid ounces.	Liters to quarts.	Dekaliters to gallons.	Hektoliters to bushels.
1 =	0·27	0·338	1·0567	2·6417	2·8375
2 =	0·54	0·676	2·1134	5·2834	5·6750
3 =	0·81	1·014	3·1700	7·9251	8·5125
4 =	1·08	1·352	4·2267	10·5668	11·3500
5 =	1·35	1·691	5·2834	13·2085	14·1875
6 =	1·62	2·029	6·3401	15·8502	17·0250
7 =	1·89	2·368	7·3968	18·4919	19·8625
8 =	2·16	2·706	8·4534	21·1336	22·7000
9 =	2·43	3·043	9·5101	23·7753	25·5375

30. Weight.

	Milligrammes to grains.	Kilogrammes to grains	Hektogrammes (100 grm.) to ounces avoirdupois.	Kilogrammes to pounds avoirdupois.
1 =	0·01543	15432·36	3·5274	2·20462
2 =	0·03086	30864·71	7·0548	4·40924
3 =	0·04630	46297·07	10·5822	6·61386
4 =	0·06173	61729·43	14·1096	8·81849
5 =	0·07716	77161·78	17·6370	11·02311
6 =	0·09259	92594·14	21·1644	13·22773
7 =	0·10803	108026·49	24·6918	15·43235
8 =	0·12346	123458·85	28·2192	17·63697
9 =	0·13889	138891·21	31·7466	19·84159

31. Weight—(continued.)

	Quintals to pounds avoirdupois.	Milliers or tonnes to pounds avoirdupois.	Grammes to ounces troy.
1 =	220·46	2204·6	0·03215
2 =	440·92	4409·2	0·06430
3 =	661·38	6613·8	0·09645
4 =	881·84	8818·4	0·12860
5 =	1102·30	11023·0	0·16075
6 =	1322·76	13227·6	0·19290
7 =	1543·22	15432·2	0·22505
8 =	1763·68	17636·8	0·25721
9 =	1984·14	19841·4	0·28936

By the concurrent action of the principal governments of the world, an International Bureau of Weights and Measures has been established near Paris. Under the direction of the International Committee, two ingots were cast of pure platinum-iridium in the proportion of 9 parts of former to 1 part of the latter metal. From one of these a certain number of kilogrammes were prepared, from the other a definite number of meter bars. These standards of weight and length were intercompared, without preference, and certain ones were selected as international prototype standards. The others were distributed by lot to the different governments, and are called national prototype standards. Those apportioned to the United States are in the keeping of this office.

The metric system was legalized in the United States in 1866.

The international standard meter is derived from the *meter des archives*, and its length is defined by the distance between two lines at 0° Centigrade, on a platinum-iridium bar deposited at the International Bureau of Weights and Measures.

The international standard kilogramme is a mass of platinum-iridium deposited at the same place, and its weight in vacuo is the same as that of the kilogramme des archives.

The liter is equal to a cubic decimeter of water, and it is measured by the quantity of distilled water which, at its maximum density, will counterpoise the standard kilogramme in a vacuum, the volume of such a quantity of water being, as nearly as has been ascertained, equal to a cubic decimeter.

in turn involved many investigations in regard to the best methods to be pursued, the improvement and construction of apparatus, and studies in thermometry and barometry, which resulted in establishing a standard thermometric scale and a standard barometer.

It was decided to make the new international meter a line measure, and to derive it and the kilogramme from the meter and kilogramme of the archives. The material chosen for the new standards was an alloy of pure platinum-iridium, in the proportion of nine parts of the former to one of the latter. Two ingots were cast, and from one of them a certain number of kilogrammes were prepared; from the other a definite number of meter bars. The standards of length and weight were intercompared without preference, and certain ones were selected for deposit and safe keeping at the international bureau, and are called international prototypes. The others were distributed by lot to the different governments ordering them, and are called national prototypes.

The distribution was made in September, 1889, and those apportioned to the United States are in the keeping of this office.

The comparison of length measures with the United States standards will be undertaken on application. It is not necessary to explain the well-known methods by which the shorter length measures are compared with greater or less precision. The degree of refinement to which the comparisons are carried will depend, of course, on the purpose for which the measures are to be used. Where great accuracy is required a special understanding with this office should be had. The means used for verifying tape lines are less well known and a description will therefore be of use.

The United States Mural or Bench Standard.—This apparatus derives its name from the fact that it was originally attached to a wall. As constructed in 1884, and as now arranged, it consists of a wooden bench 104 ft. long, having upon it an iron bar with German silver plugs on which the graduation is traced. The bench is made of white pine wood well seasoned and painted. The planks used in its construction are 2 in. thick and 11½ in. wide; they are supported on cedar posts firmly planted in the ground.

The top of the bench and the bar are protected from the weather by a cover made in sections, each section attached by hinges to the bench, and sufficiently inclined to shed the rain.

The iron bar offers a continuous surface a little over 100 ft. long. The bar is 2 in. wide and $\frac{7}{8}$ in. thick; it rests upon equidistant brass rollers $\frac{5}{8}$ in. in diameter; these in turn rest on the bench.

At each side of the bar, parallel to it and firmly attached to the bench, is a strip of wood of such thickness as to bring its surface even with the surface of the bar. Sufficient space is left between these strips and the bar to allow free circulation of the air and not to hinder the expansion of the bar. At one end the bar has a device for clamping a tape or wire when the initial lines of the latter and of the standard bar are in coincidence. A spring balance for giving any desired tension is also provided. This has a clamp for holding the tape or wire, and it can be set on any part of the standard to conform to the length of the tape. Lengthwise the bar, two parallel series of German silver plugs are inserted in the bar at suitable distances apart to receive the graduation, one being subdivided into yards and in places into feet, the other into meters. The yard graduation is intended to be standard at 62° F., 16·67 C.; the metric at 32° F., or 0° C.

In comparing, the tape line is stretched under the desired tension on the standard bar, and the difference between its graduation and that of the latter is read either by means of a finely subdivided scale or, where the graduation of the tape warrants the refinement, by means of a low power microscope.

The chief advantage of using an iron bar over marks on bolts let into a wall is that the difference between the expansion of the tape and of the bar is very small.

The question of temperature enters only very slightly, assuming that the temperature at which the iron bar is standard has been carefully determined, and that both tape and bar are at the same temperature during the comparison.

The verification of weights and capacity measures will be undertaken, and a statement issued showing their relation to the United States standards. Weights and measures submitted for comparison should conform to correct principles of construction. The cost of all comparisons for other than State or national purposes must be borne by those for whom they are made. The amount is calculated so as to cover the cost to the general government of the services of the person charged with making comparisons.

(See Tables on pages 84, 85.)

32. *Household and Miscellaneous Tables.*—The following tables may be of assistance in prescribing fluid preparations. They are;

Teaspoonful	about 1	fl. drm.
Dessertspoonful	about 2	fl. drm.
Tablespoonful	about 4	fl. drm.
Wineglassful	about 2	fl. oz.
Teacupful	about 4	fl. oz.
Breakfastcupful	about 8	fl. oz.
Tumblerful	about 8	fl. oz.
Thimbleful	about ¾	fl. drm.
Pinch (of leaves and flowers)	about 1	(troy.) drm.
Handful (of leaves and flowers)	about 10	(troy.) drm.

8 wineglassfuls, each two fluid ounces, in a pint.

32 tablespoonfuls, each one-half fluid ounce, in a pint.

16 tablespoonfuls, each one-half fluid ounce, in half a pint.

12 tablespoonfuls, each one-half fluid ounce, in six fluid ounces.

24 dessertspoonfuls, each two fluid drachms, in six fluid ounces.

16 dessertspoonfuls, each two fluid drachms, in four fluid ounces.

32 teaspoonfuls, each one fluid drachm, in four fluid ounces.

16 teaspoonfuls, each one fluid drachm, in two fluid ounces.

8 teaspoonfuls, each one fluid drachm, in one fluid ounce.

33. Weights and Measures for Domestic Purposes.—Wheat flour, one pound is a quart.

Indian meal, one pound two ounces is one quart.

Butter, when soft, one pound is one quart.

White sugar, when powdered, one pound one ounce is one quart.

Best brown sugar, one pound two ounces is one quart.

Liquids.—Sixteen large tablespoonfuls are half a pint.

Eight large tablespoonfuls are one gill.

Four large tablespoonfuls are half gill.

Twenty-five drops are equal to one teaspoonful.

A common wineglass is equal to a half gill.

A common tumbler is equal to a half gill.

34. To Reduce Parts by Volume, or Measure to Parts by Weight.—Multiply the parts by volume, or measure by the specific gravity of the different substances: the result will be parts by weight.

35. *Electrical Horse Power.*

Calculated from $\frac{E \times C}{746}$

Current in Ampères.	E.M.F. in Volts.													
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
5	0·06	0·13	0·20	0·28	0·33	0·40	0·47	0·53	0·60	0·67	0·73	0·80	0·87	0 93	1 0
10	0·13	0·28	0·40	0·53	0·67	0·80	0·93	1·07	1·2	1·3	1·4	1·6	1·6	1·9	2·0
20	0·28	0·53	0·80	1·07	1·3	1·6	1·9	2·1	2·4	2·7	2·9	3·2	3·5	3·7	4·0
30	0·40	0·80	1·2	1·6	2·0	2·4	2·8	3·2	3·6	4·0	4·4	4·8	5·2	5·6	6 0
40	0·53	1·07	1·6	2·1	2·6	3·2	3·7	4·2	4·8	5·3	5·9	6·4	6·9	7·5	8·0
50	0·67	1·30	2·0	2·6	3·3	4·0	4·6	5·4	6 0	6·7	7·4	8·0	8·7	9·4	10·0
60	0·80	1·6	2·4	3·2	4·0	4·8	5·6	6·4	7·2	8·0	8·8	9·6	10·4	11·2	12·0
70	0·93	1·9	2·8	3·7	4·6	5·6	6·5	7·5	8·4	9·4	10·3	11·2	12·3	13·1	14·0
80	1·07	2·1	3·2	4·2	5·4	6 4	7·5	8·5	9·6	10·7	11·8	12·8	13·9	15·0	16·0
90	1·2	2·4	3·6	4·8	6·0	7·2	8·4	9·6	10·8	12·0	13·2	14·4	15·6	16·9	18·0
100	1·3	2·7	4·0	5·3	6·7	8·0	9·4	10·7	12·0	13·4	14·7	16·0	17·4	18·7	20·0
110	1·4	2·9	4·4	5·9	7·4	8·8	10·3	11·8	13·2	14·7	16·2	17·6	19·1	20·6	22·0
120	1·5	3·2	4·8	6·4	8·0	9·6	11·2	12·8	14·4	16·0	17·6	19·2	20·9	22·5	24·0
130	1·6	3·5	5·2	6·9	8·7	10·4	12·3	13·9	15·6	17·4	19·1	20·9	22·6	24·4	26·0
140	1·9	3·7	5·6	7·5	9·4	11·2	13·1	15·0	16·9	18·7	20·6	22·5	24·4	26·2	28·0
150	2·0	4·0	6·0	8·0	10·0	12·0	14·0	16·0	18·0	20·0	22·0	24·0	26·0	28·0	30·0

E.H.P. on current line, under E.M.F.

36. *Wire Gauges, in Decimal Parts of an Inch.*

Number of wire gauge.	Roebling.	Brown & Sharpe.	Birmingham, or Stubs.	English Legal Standard.	Old English, or London.
000000	0·46	....	.....	0·464	....
00000	0·43	.....	.....	0·432	.....
0000	0·393	0·46	0·454	0·4	0·454
000	0·362	0·40964	0·425	0·372	0·425
00	0·331	0·3648	0·380	0·348	0·38
0	0·307	0·32495	0·340	0·324	0·34
1	0·283	0·2893	0·3	0·3	0·3
2	0·263	0·25763	0·284	0·276	0·284
3	0·244	0·22942	0·259	0·252	0·259
4	0·225	0·20431	0·238	0·232	0·238
5	0·207	0·18194	0·22	0·212	0·22
6	0·192	0·16202	0·203	0·192	0·203
7	0·177	0·14428	0·18	0·176	0·18
8	0·162	0·12849	0·165	0·16	0·165
9	0·148	0·11443	0 148	0·144	0·148
10	0·135	0·10189	0·134	0·128	0·134
11	0·12	0 09074	0·12	0·116	0·12
12	0·105	0 08081	0·109	0·104	0·109
13	0·092	0·07196	0·095	0·092	0·095
14	0·08	0·06408	0·083	0·08	0·083
15	0·072	0·05706	0·072	0·072	0·072
16	0·063	0·05082	0·065	0·064	0·065
17	0·054	0·04525	0·058	0·056	0·058
18	0·047	0·0403	0·049	0·048	0·049
19	0·041	0·03589	0·042	0·04	0·04
20	0·035	0·03196	0 035	0·036	0·035
21	0·032	0·02846	0·032	0·032	0·0315
22	0·028	0·02534	0·028	0·028	0·0295
23	0·025	0·02257	0·025	0·024	0·027
24	0 023	0·0201	0·022	0·022	0·025
25	0·02	0·0179	0·02	0·02	0·023
26	0·018	0·01594	0·018	0·018	0·0205
27	0·017	0·01419	0·016	0·0164	0·01875
28	0·016	0·01264	0·014	0·0148	0·0165
29	0·015	0·01125	0·013	0·0136	0·0155
30	0·014	0·01002	0·012	0·0124	0·01375
31	0·0135	0·00893	0·010	0·0116	0·01225
32	0·013	0·00795	0·009	0·0108	0·01125
33	0·011	0·00708	0·008	0·01	0·01025
34	0·01	0·0063	0·007	0·0092	0·0095
35	0·0095	0·00561	0·005	0·0084	0·009
36	0·009	0·005	0·004	0·0076	0·0075

37. *Table Indicating Size, Weight and Length of Iron and Steel Wire.*

Gauge Numbers.	Diameter. Inches.	Weight of 100 feet. Pounds.	Weight of one mile. Pounds.	Feet in 2000 Pounds.	Area. Square Inches.
3-0	·362	34·73	1834	5,759	·102921
2-0	·331	29·04	1533	6,886	·086049
1-0	·307	25·00	1318	8,000	·074023
1	·283	21·23	1121	9,425	·062901
2	·263	18·34	968	10,905	·054325
3	·244	15·78	833	12,674	·046759
4	·225	13·39	707	14,936	·039760
5	·207	11·35	599	17,621	·033653
6	·192	9·73	514	20,555	·028952
7	·177	8·30	439	24,906	·024605
8	·162	6·96	367	28,734	·020612
9	·148	5·80	306	34,483	·017203
10	·135	4·83	255	41,408	·014313
11	·120	3·82	202	52,356	·011309
12	·105	2·92	154	68,493	·008659
13	·092	2·24	118	89,286	·006647
14	·080	1·69	89	118,343	·005026
15	·072	1·37	72	145,985	·004071
16	·063	1·05	55	190476	·003117
17	054	0·77	41	259,740	·002290
18	·047	0·58	31	344,827	·001734
19	·041	0·45	24	444,444	·001320
20	·035	0·32	17	625,000	·000962
21	·032	0·27	14	740,741	·000804
22	·028	0·21	11	952,381	·000615
23	·025	0·175	9·24		0·0491
24	·023	0·140	7·39		·000415
25	·020	0·116	6·124		·000314
26	·018	0·093	4·91		·000254
27	·017	0·083	4·382		·000227
28	·016	0·074	3·907		·000201
29	·015	0·061	3·22		·000176
30	·014	0·054	2·851		·000154
31	·0135	0·050	2·64		·000143
32	·013	0·046	2·428		·000132
33	·011	0·037	1·953		·000095
34	·010	0 030	1·584		0·0078
35	·0095	0·025	1·32		·000071
36	·009	0·021	1·161		·000064

38. *Resistance and Weight Table.*—American Gauge for Cotton and Silk Covered and Bare Copper Wire.—The resistances are calculated for pure copper wire.
The number of feet to the pound is only approximate for insulated wire.

No.	Diameter.	FEET PER POUND.			RESISTANCE, NAKED COPPER.			
		Cotton Covered.	Silk Covered.	Naked.	Ohms per 1000 feet.	Ohms per mile.	Feet per ohm.	Ohms per pound.
8	·12849			20	·6259	3·3	1600·	·0125
9	·11443			25	·7892	4·1	1272·	·0197
10	·10189			32	·8441	4·4	1185·	·0270
11	·09074			40	1·254	6·4	798·	·0501
12	·08081	42	46	50	1·580	8·3	633·	·079
13	·07196	55	60	64	1·995	10·4	504·	·127
14	·06408	68	75	80	2·504	13·2	400·	·200
15	·05707	87	95	101	3·172	16·7	316·	·320
16	·05082	110	120	128	4·001	23·	230·	·512
17	·04525	140	150	161	5·04	26·	198·	·811
18	·0403	175	190	203	6·36	33·	157·	1·29
19	·03539	220	240	256	8·25	43·	121·	2·11
20	·03196	280	305	324	10·12	53·	99·	3·27
21	·02846	360	390	408	12·76	68·	76·5	5·20
22	·02535	450	490	514	16·25	85·	61·8	8·35
23	·02257	560	615	649	20·30	108·	48·9	13·3
24	·0201	715	775	818	25·60	135·	39·0	20·9
25	·0179	910	990	1030	32·2	170·	31·0	33·2
26	·01594	1165	1265	1300	40 7	214·	24·6	52·9
27	·01419	1445	1570	1640	51·3	270·	19·5	84·2
28	·01264	1810	1970	2070	64·8	343·	15·4	134·
29	·01126	2280	2480	2617	81·6	432·	12·2	213·
30	·01002	2805	3050	3287	103·	538·	9·8	338·
31	·00893	3605	3920	4144	130·	685·	7·7	539·
32	·00795	4585	4930	5227	164·	865·	6·1	856·
33	·00708		6200	6590	206·	1033·	4·9	1357·
34	·0063		7830	8330	260·	1389·	3·8	2166·
35	·00561		9830	10·60	328·	1820·	2·9	3521·
36	·005		12420	13210	414	2200·	2·4	5469·

39. *Weight in Pounds per Mile of Copper Wire.*

Number.	Roebling.	Birmingham.	Brown & Sharpe.	English Legal Standard.
0000	2466	3286	3375	2555
000	2092	2884	2677	2210
00	1750	2305	2123	1933
0	1504	1846	1684	1682
1	1278	1437	1335	1437
2	1104	1287	1058	1216
3	950	1071	839	1012
4	808	904	665	860
5	684	773	528	718
6	588	657	418	588
7	500	517	332	495
8	419	435	263	409
9	350	350	209	332
10	291	287	166	263
11	230	230	131	215
12	176	190	104	173
13	135	144	83	135
14	102	110	65	102
15	83	83	52	83
16	64	68	41	65
17	47	53¾	33	50
18	35	38	26	37
19	27	28	20¾	26
20	19½	19½	16¼	20¾
21	16⅓	16¼	13	16¼
22	12½	12½	10¼	12½
23	10¼	10¼	8⅛	9¼
24	8¼	7¾	6½	7¾
25	6⅛	6½	5⅛	6½
26	5	5	4	5
27	4⅛	4	3¼	4
28	4	3¼	2½	3¼
29	3⅝	2⅝	2	3
30	3¼	2¼	1⅝	2½

Specific Gravity.

Tables Showing a Comparison of the Degrees of Baumé, Cartier and Beck's Areometers, with Specific Gravity Degrees.

40. For Liquids Lighter than Water.

Degrees of Baumé, Cartier, Beck.	Baumé. Sp. Gr.	Cartier. Sp. Gr.	Beck. Sp. Gr.
0	.....	.....	1·0000
1	.....	.....	0·9941
2	.....	.....	0·9883
3	.....	.....	0·9826
4	.....	.....	0·9770
5	.....	.....	0·9714
6	.....	.....	0·9659
7	.....	.....	0·9604
8	.....	.....	0·9550
9	.....	.....	0·9497
10	1·000	...	0·9444
11	0·993	1·000	0·9392
12	0·986	0·992	0·9340
13	0·979	0·985	0·9289
14	0·973	0·977	0·9239
15	0·967	0·969	0·9189
16	0·960	0·962	0·9139
17	0·954	0·955	0·9090
18	0·948	0·948	0·9042
19	0·942	0·941	0·8994
20	0·935	0·934	0·8947
21	0·929	0·927	0·8900
22	0·924	0·920	0·8854
23	0·918	0·914	0·8808
24	0·912	0·908	0·8762
25	0·906	0·901	0·8717
26	0·901	0·895	0·8673
27	0·895	0·889	0·8629
28	0·889	0·883	0·8585
29	0·884	0·877	0·8542
30	0·879	0·871	0·8500
31	0·873	0·865	0·8457
32	0·868	0·859	0·8415
33	0·863	0·853	0·8374
34	0·858	0·848	0·8333
35	0·853	0·842	0·8292
36	0·848	0·837	0·8252
37	0·843	0·831	0·8212
38	0·838	0·826	0·8173
39	0·833	0·820	0·8133
40	0·829	0·815	0·8095
41	0·824	0·810	0·8061
42	0·819	0·805	0·8018
43	0·815	0·800	0·7981
44	0·810	.....	0·7944
45	0·806	.....	0·7907
46	0·801	.....	0·7871
47	0·797	.....	0·7834
48	0·792	.....	0·7799
49	0·788	.....	0·7763
50	0·784	.....	0·7727
51	0·781	.....	0·7692
52	0·776	.....	0·7658
53	0·771	.....	0·7623
54	0·769	.....	0·7589
55	0·763	.....	0·7556
56	0·759	.....	0·7522
57	0·755	.....	0·7489
58	0·751	.....	0·7456
59	0·748	.....	0·7423
60	0·744	.....	0·7391
61	0·740	.....	0·7359
62	0·736	.....	0·7328
63	.....	.....	0·7296
64	.....	.....	0·7265
65	.....	.....	0·7234
66	.....	.....	0·7203
67	.....	.....	0·7173
68	.....	.....	0·7142
69	.....	.....	0·7112
70	.....	.....	0·7083

41. For Liquids Heavier than Water.

Degrees of Baumé, Beck.	Baumé. Sp. Gr.	Beck. Sp. Gr.
0	1·000	1·0000
1	1·007	1·0059
2	1·014	1·0119
3	1·020	1·0180
4	1·028	1·0241
5	1·034	1·0303
6	1·041	1·0366
7	1·049	1·0429
8	1·057	1·0494
9	1·064	1·0559
10	1·072	1·0625
11	1·080	1·0692
12	1·088	1·0759
13	1·096	1·0828
14	1·104	1·0897
15	1·113	1·0968
16	1·121	1·1039
17	1·130	1·1111
18	1·138	1·1184
19	1·147	1·1258
20	1·157	1·1333
21	1·166	1·1409
22	1·176	1·1486
23	1·185	1·1565
24	1·195	1·1644
25	1·205	1·1724
26	1·215	1·1806
27	1·225	1·1888
28	1·235	1·1972
29	1·245	1·2057
30	1·256	1·2143
31	1·267	1·2230
32	1·278	1·2319
33	1·289	1·2409
34	1·300	1·2500
35	1·312	1·2593
36	1·324	1·2680
37	1·337	1·2782
38	1·349	1·2879
39	1·361	1·2977
40	1·375	1·3077
41	1·388	1·3178
42	1·401	1·3281
43	1·414	1·3386
44	1·428	1·3492
45	1·442	1·3600
46	1·456	1·3710
47	1·470	1·3821
48	1·485	1·3934
49	1·500	1·4050
50	1·515	1·4167
51	1·531	1·4286
52	1·546	1·4407
53	1·562	1·4530
54	1·578	1·4655
55	1·596	1·4783
56	1·615	1·4912
57	1·634	1·5044
58	1·653	1·5179
59	1·671	1·5315
60	1·690	1·5454
61	1·709	1·5596
62	1·729	1·5741
63	1·750	1·5888
64	1·771	1·6038
65	1·793	1·6190
66	1·815	1·6346
67	1·839	1·6505
68	1·864	1·6667
69	1·885	1·6832
70	1·909	1·7000
71	1·935	.....
72	1·960	.....

Chemical Synonyms.

The following list of the principal chemicals and their synonyms is intended only as a guide to the amateur, who may be saved both time and money by its use, but makes no pretense to being complete. A complete list of every known chemical would require a volume. The list of synonyms of chemicals which are given at all will be found very complete. Only a few of the organic compounds are given, as they will not be much used by the amateur.

The authorities consulted are Watt's Dictionary of Chemistry, and the works of Fownes, Wurtz, Roscoe, Schlorlemmer, Bloxham, Attfield, Fresenius, Cooley, etc., and great care has been taken to avoid mistakes, which are very liable to occur in compilations of this kind.

The names of minerals are given in brackets, thus [Halite]. The number of the minerals noticed is not great, as the majority have a more or less complex formula.

The chemical symbols are added, as they are really equal to a name.

The Latin names, as well as those of other languages, are printed in italics, with the letters (L. Ger. or Fr.) for Latin, German and French. Many of the names are obsolete, or nearly so, but still it is of the utmost importance that their exact meaning is given.

In general the subject is arranged under the principal constituent; thus, to find Potassium Carbonate, look for **Potassium.**

Acetum:—Vinegar.

Acetic Acid:—$H(C_2H_3O_2)$. Hydrogen Acetate; Hydric Acetate; Acetulic Acid; *Acidum Aceticum* (L.), *Acide Acetique* (Fr.); *Essigsäure* (Ger.); Pyroligneous Acid; when free from water it is called Acetic Hydrate, Monohydrated Acetic Acid, Glacial Acetic Acid, *Acetum Glaciale* (Fr.); Acid of Vinegar; *Acidum Aceticum Glaciale* (L.); sometimes called Radical Vinegar.

Acetylene:—C_2H_2. Klumene. Ethine.

Acid:—See the name of the acid; only the principal ones are given.

Alcohol:—C_2H_6O. Ethyl Alcohol; Ethyl Hydrate; Hydroxl-Ethane; Methyl Carbinol; Methyl Carbonal; *Alcoöl* (Fr.); *Alkahol* (Ger.); Rectified Spirits; Proof Spirit; Spirits of Wine; S. V.; S. V. R.; and S. V. P.; *Alcohol Vini* (L.); Ethylic Alcohol; Absolute Alcohol is also called Anhydrous Alcohol.

Amylic Alcohol. See **Fusel Oil.**

Methylic Alcohol:—CH_4O. Wood Naphtha; Wood Spirit; Wood Alcohol; Pyroligneous Spirit; Pyroxylic Spirit.

Aldehyd:—C_2H_4O. Aldehyde; Acetic Aldehyde; Ethyl Aldehyde; Hydrated Oxide of Acetyle, or Acetule; Hydrate of Othyle; Acetaldehyd; Hydride of Acetyl.

Alum:—$Al_2(SO_4)_3.K_2SO_4+24H_2O$. Double Sulphate of Aluminum and Potassium; Sulphate of Aluminum and Potassium; Octahedral Alum Salt; Potash-Alum; *Alumen, A. Potassicum* (L.); *Alun* (Fr.); *Alaun* (Ger.).

Alum, Ammonia:—$Al_2(SO_4)_3.(NH_4)_2SO_4+24H_2O$. *Alumen Ammoniatum* (L.); Sulphate of Aluminum and Ammonium; *Aluminii et Ammonii Sulphas* (L.).

Alum, Burnt:—$K_2Al_2(SO_4)_4$. Dried Alum; *Alumen Exsiccatum* (L.); *Alun Scc* (Fr.).

Alum Chrome:—$Cr_2(SO_4)_3.K_2SO_4+24H_2O$. Double Sulphate of Chromium and Potassium.

Alum, Iron:—$Fe_2(SO_4)_3.K_2SO_4+24H_2O$. *Alumen Ferricum, Sulphas Ferri et Potassæ* (L.).

Alum, Roman:—Red Alum; Roman Alum; Roach Alum; [Alum Stone]; *Roche Alum* (Fr.); Rock Alum; *Alumen Romanum* (L.); *Alum Rupeum* (L.); Cubical Alum; Impure variety of alum containing iron

Alum, Soda:—$Na_2SO_4.Al_2(SO_4)_3.24H_2O$. *Sulphas Aluminæ et Sodæ* (L.); Solfaterite.

Aluminium:—Al. Aluminum, English, French, and Latin; *Aluminum* (Ger.) It has been proposed to shorten it to Alium.

Aluminium Acetate:—$Al_2(C_2H_3O_2)_3$. Acetate of Alumina.

Aluminium Chloride:—Al_2Cl_6. Sesquichloride of Aluminum: *Aluminii Chloridi* (L)., Chloralum (Impure).

Aluminium Fluoride:—AlF_3.

Aluminium Hydrate:—$Al_2(HO)_6$. Aluminum Hydroxide; Hydrated Alumina, *Aluminii Hydras* (L).

Aluminium Nitrate:—$Al_2(NO_3)_6$. Nitrate of Alumina; *Aluminæ Nitras* (L).

Aluminium Oxide:—Al_2O_3. Alumina; [Emery and Corundum are varieties of the oxide, Adamantine Spar.] Alumine.

Aluminium Silicate:—$Al_2(SiO_2)_3$. Silicate of Alumina.

Aluminium Sodium Fluoride:—$AlF_3.2NaF$. [Cryolite.]

Aluminium Sulphate :—$Al_2(SO_4)_3$. $18H_2O$. Neutral Sulphate of Alumina; Sesquisulphate of Alumina; [Alunogen]; *Aluminii Sulphas* (L.); Sometimes called cake alum or concentrated alum (erroneous).

Aluminium Sulphide:—Al_2S_3. Sulphide of Aluminium.

Ammonia:—NH_3. Anhydrous Ammonia; Ammonia Gas; Volatile Alkali; Volatile Air; Ammoniacal Gas; Terhydride of Nitrogen; *Ammoniaque* (Fr.); *Ammoniak* (Ger.).

Ammonia, Solution of:—Ammonia; Ammonia Water; *Liquor Ammoniæ*, (L.); Spirits of Sal Ammoniac; Ammonium Hydrate; Ammonia: Spirits of Hartshorn; *Ammoniaque Liquide, Esprit de Sal Ammoniac* (Fr.); *Salmiak-Geist* (Ger.); *Aqua Ammoniæ* (L.).

Ammonium:—(NH_4).

Ammonium, Acetate:—$(NH_4)C_2H_3O_2$. *Ammoniæ Acetas* (L.); Spirit of Mindererus (Med.)

Ammonium Arseniate:—$(NH_4)_3AsO_4$. *Ammonii Arsenias* (L.).

Ammonium Binarseniate:—$(NH_4)_2AsO_4$.

Ammonium Arsenite:—NH_4AsO_2. *Ammoniæ Arsenis* (L.).

Ammonium Benzoate:—$NH_4,C_7H_5O_2$. *Solutio Ammoniæ Benzoas; Ammonii Benzoas* (L.).

Ammonium Bromide:—NH_4Br. *Ammonii Bromidum; Ammonii Bromis* (L.).

Ammonium Carbonate:—There are three carbonates of ammonia.

Ammonia Normal Carbonate:—$(NH_4)_2CO_3,H_2O$. Di-ammonic Carbonate; Volatile Salt; Smelling Salts; Sal Volatile (alcoholic solution); Neutral Carbonate of Ammonium; Carbonate of Oxide of Ammonium.

Ammonium Sesquicarbonate: — $(NH_4)_4H_2(CO_3)_3,H_2O$. Tetra ammonio-dihydric Carbonate; Half-acid Carbonate of Ammonia; *Ammonii Carbonas* (L.); Preston Salts; Smelling Salts; Volatile Spirits of Hartshorn.

Ammonium Bicarbonate:—$H(NH_4)CO_3$. Acid Carbonate of Ammonium; Ammonium and Hydrogen Carbonate; Ammonio-hydric Carbonate; Mono-Ammoniac Carbonate.

Ammonium Chloride:—NH_4Cl. Sal Ammoniac; [Salmiak]; Ammonic Chloride; Hydrochlorate of Ammonia; *Ammonia Muriatica* (L.); Ammoniac Chloride Muriate of Ammonia; *Sel Ammoniac* (Fr.); *Ammonii Chloridum* (L.).

Ammonium Citrate :—$(NH_4)_3HC_6H_5O_7$. Citrate of Oxide of Ammonia; *Ammoniæ Citras* (L.); Di-ammonium Citrate.

Ammonium Ferrocyanide: — $(NH_4)_4FeC_6N_6$. 3Aq.

Ammonium Iodide:—NH_4I. Hydriodate of Ammonia; *Ammonii Iodidum* (L.).

Ammonium Nitrate:—$(NH_4)NO_3$. *Ammoniæ Nitras* (L.); Nitrous Ammoniacal Salt; Nitrate of Oxide of Ammonium.

Ammonium Nitrite:—Hyponitrite of Ammonium; Nitrite of Oxide of Ammonium.

Ammonium Oxalate :—$(NH_4)_2C_2O_4$. *Ammoniæ Oxalis* (L.); Ammonic Oxalate.

Ammonium Phosphates:—$(NH_4)_3PO_4$. Normal Ammonium Phosphate.

Ammonium Phosphate:—$(NH_4)_2HPO_4$. *Ammonii Phosphas* (L.); Tribasic Phosphate of Ammonium.

Ammonium Sodium and Hydrogen Phosphate:—$Na(NH_4)HPO_4,4H_2O$. Microcosmic Salt; Phosphorus Salt; Fusible Salt of Urine.

Ammonium Sulphate:—$(NH_4)_2SO_4$. Glauber's Secret Salt; Glauber's Secret Sal Ammoniac; Sulphate of Oxide of Ammonia; *Ammoniæ Sulphas* (L.); Ammoniacal Secret Salt of Glauber.

Ammonium Sulphocyanide:—NH_4CNS.

Ammonium Sulphide:—$(NH_4)_2S$. Ammonic Sulphide; Sulphuret of Ammonium; Hydrosulphuret of Ammonia.

Ammonium Sulphohydrate :—NH_4HS. Sulphide of Ammonia; Hydrosulphide of Ammonia; Hydrosulphate of Ammonia; Ammonium and Hydrogen Sulphide; Bihydrosulphuret of Ammonia.

Ammonium Persulphide:—Hoffman's Volatile Spirit of Sulphur; Boyles' Fuming Liquor (Obsolete); *Ammoniæ Perhydrosulphas* (L.).

Ammonium Sulphite:—$(NH_4)_2SO_3$7Aq. Sulphite of Oxide of Ammonium.

Ammonium Sulphocyanide:—NH_4CNS.

Ammonium Tartrate:—$(NH_4)_2C_4H_4O_6$. *Ammoniæ Tartras* (L.).

Ammonium Bitartrate:—$NH_4HC_4H_4O_6$. *Ammoniæ Bitartras* (L.).

Ammonium Valerianate :—$NH_4C_5H_9O_2$. *Ammonii Valerianas* (L.).

Amyl:—C_5H_{11}. (The Radical.)

Amyl Acetate:—$C_5H_{11}C_2H_3O_2$. Pearl oil.

Amyl Nitrite:—$C_5H_{11}.NO_2$. *Amyl Nitris* (L.).

Amyl, Valerianate of:—$C_5H_{11}C_5H_9O_2$. Apple oil.

Aniline:—$C_6H_5.NH_2$. Phenylamine; *Anilina* (L.).

Antimony:—Metallic, Sb.; Regulus of Antimony; *Stibium* (L.); *Antimone* (Fr.); *Spiessglanz* (Ger.).

Antimony, Butter of:—Antimony Trichloride.

Antimony, Trichloride:—$SbCl_3$. Terchloride of Antimony; Antimonious Chloride; Butter of Antimony; Chloride of Antimony; Sesquichloride of Antimony; Caustic Antimony; *Antimonii Chloridum* (L.).

Antimony, Pentachloride:—$SbCl_5$. *Antimonii Pentachloridum* (L.).

Antimony, Diaphoretic:—Antimoniate of Potash; *Stibiated Kali* (L.); Calcined Antimony; Antimoniate of Potash.

Antimony, Flowers of:—Sb_2O_3. White Oxide of Antimony.

Antimony, Trifluoride:—SbF_3.

Antimony, Pentafluoride:—SbF_5.

Antimony, Glass of:—Vitrified Antimony; Gray Oxide of Antimony; Vitrified Oxide of Antimony; *Antimonii Vitrum* (L.).

Antimony, Hydride:—SbH_3. Stibine; Hydrogen Antimonide; Antimonious Hydride.

Antimony, Liver of:—*Hepar Antimonii* (L.).

Antimony Trioxide:—Sb_2O_3. Antimonious Oxide; Protoxide of Antimony; Hypantimonious Acid; Oxide of Antimony; Teroxide of Antimony; *Antimonii Oxidum* (L.).

Antimony, Tetroxide:—Sb_2O_4. Antimonious Acid; Antimony-Antimonate; [Cervantite]; Antimonoso-Antimonic Oxide; Diantimonic Tetroxide.

Antimony Pentoxide:—Sb_2O_5. Antimonic Oxide.

Antimony, Oxychloride of:—SbOCl. Powder of Algaroth.

Antimony, Oxysulphide of:—$Sb_2O_3 2Sb_2S_3$.

Antimony, Red:—Oxysulphide of Antimony; Oxysulphuret of Antimony; Crocus of Antimony. See Oxysulphide, above.

Antimony, Regulus of:—*Regulus Antimonii* (L.); Metallic Antimony.

Antimony, Sulphurated:—Precipitated Sulphide of Antimony; Oxysulphuret of Antimony; Golden Sulphuret of Antimony; *Antimonium Sulphuratum* (L.).

Antimony, Pentasulphide:—Sb_2S_5. Antimonic Sulphide; Sulphur Auratum (L.).

Antimony, Trisulphide;—Sb_2S_3. Antimonious Sulphide; Sulphide of Antimony; Black Sulphide of Antimony; Tersulphide of Antimony; Sulphuret of Antimony; Sesquisulphuret of Antimony; Gray Antimony; [Stibnite Antimonite; Antimony Glance]; Crude Antimony; *Judex Ultimus* (L.).

Antimony, Tartarated:—$KSbOC_4H_4O_6$.Aq. *Antimonii et Potassii Tartras* (L.). Tartar Emetic; Emetic Tartar; Tartarized Antimony; *Antimonium Tartaratum* (L.).

Aqua, Water:

Aqua Ammoniæ. See **Ammonia**, Solution of.

Aquafortis:—Nitric Acid.

Aqua Regia:—Nitro-hydrochloric acid.

Aqua Vitæ:—Native distilled spirit, usually French brandy.

Argol:—See **Potassium Bitartrate.**

Arsenic:—As. *Arsenium; Arsenicum;* (L.).

Arsenic Anhydride:—As_2O_5. Arsenic Acid; Anhydrous Arsenic Acid; *Acidum Arsenicum* (L.).

Arsenious Anhydride:—As_2O_3; Arsenious Acid; Arsenic; White Arsenic; *Arsenic Blanc* (Fr.); [Arsenolite.]

Arsenic Tribromide:—$AsBr_3$. Sesquibromide of Arsenic; Terbromide of Arsenic; *Arsenici Bromidum* (L.).

Arsenic Trichloride:—$AsCl_3$. Chloride of Arsenic; Arsenious Chloride; Terchloride of Arsenic; Sesquichloride of Arsenic; Fuming Liquor of Arsenic.

Arsenic, Fluoride of:—AsF_3. Arsenious Fluoride; Arsenic Trifluoride; Terfluoride of Arsenic.

Arsenious Hydride:—AsH_3. Arsenetted Hydrogen; Arsine; Trihydride of Arsenic.

Arsenic Dihydride:—AsH or As_2H_4.

Arsenic Triodide:—AsI_3. Arsenious Iodide.

Arsenious Oxide;—As_2O_3. White oxide of Arsenic.

Arsenic Disulphide:—As_2S_2. Arsenic Bisulphide; [Realgar]; Red Sulphide of Arsenic; Bisulphuret; Red Sulphuret of Arsenic.

Arsenic Trisulphide:—As_2S_3. Arsenious Sulphide; [Orpiment]; Yellow Sulphide of Arsenic; Sesquisulphide of Arsenic; Tersulphide of Arsenic; Tersulphuret of Arsenic; King's Yellow.

Arsenic Pentasulphide:—As_2S_5. Sulpharsenic Acid; Persulphuret of Arsenic.

Arsenide:—Arseniuret; *Arseniuretum* (L.).

Arsenite:—*Arsenis* (L.).

Azote:—Nitrogen; *Azotum* (L.).

Barium:—Ba.

Barium Acetate:—$Ba(C_2H_3O_2)$. *Barytæ Acetas* (L.).

Barium Arseniate:—$Ba_3(PO_4)_2$. *Barytæ Arsenias* (L.).

Barium Arsenite;—$Ba(AsO_2)_2$. *Barytæ Arsenis* (L.).

Barium Bromide:—$BaBr_2$. *Barii Bromidum* (L.).

Barium Carbonate;—$BaCO_3$. Carbonate of Baryta; *Barytæ Carbonas*, (L.); Boric Carbonate.

Barium Chloride;—$BaCl_2.2H_2O$. *Barii Chloridum* (L.).; Baric Chloride.

Barium Chlorate;—$Ba(ClO_3)_2$. Chlorate of Baryta; *Barytæ Chloras* (L.).

Barium, Ferrocyanide of:—$Ba_2FeC_6N_6$. *Barii Ferrocyanidum* (L.).

Barium Hydrate:—$Ba(HO)_2$. Hydrate of Baryta; *Barytæ Hydras* (L.).

Barium Iodide:—Ba_2I. *Barii Iodidum* (L.).

Barium Nitrate:—$Ba(NO_3)_2$. *Barytæ Nitras* (L.); Nitrate of Baryta.

Barium Oxalate:—BaC_2O_4. Oxalate of Baryta; *Barytæ Oxalas* (L.).

Barium Monoxide:—BaO. Baryta; Barytes Caustic Baryta; Oxide of Barium.

Barium Dioxide:—BaO_2. Barium Peroxide; Hyperoxide of Barium; Deutoxide of Barium; *Barii Binoxydum* (L.).

Barium Phosphate:—$Ba(PO_4)_2$.

Barium Sulphate:—$BaSO_4$. Sulphate of Baryta; [Barite, Heavy Spar]; *Barytæ Sulphas* (L.).

Barium Sulphide:—BaS;. Sulphuret of Baryta; Barium Monosulphide; Baric Sulphide.

Barium Sulphite:—$BaSO_3$. Sulphite of Baryta.

Barium Tartrate:—$BaC_4H_4O_6$. Tartrate of Baryta.

Benzoic Acid:—$H(C_7H_5O_2)$ or $C_7H_6O_2$. Hydrated Benzoyl; *Acidum Benzoicum* (L.);

Salt of Benzoin; Flowers of Benzoin or Benjamin.

Benzol:—C_6H_6. Benzole; Benzine; Benzene; Benzin; Hydride of Phenyl; Phenyl Hydride; Phene. Benzol (true) and Benzine should not be confounded. See those heads in the body of the Cyclopedia.

Benzol, Nitro:—See **Nitrobenzol.**

Benzoyl:—C_7H_5O.

Benzoyl Hydride:—C_7H_5OH. Essential Oil of Bitter Almonds; Essence of Bitter Almonds. Sometimes called Volatile Oil of Bitter Almonds.

Bismuth:—Bi. *Etain de Glace* (Fr.); *Wismuth* (Ger.).

Bismuth Chloride (Basic):—Bi_3Cl_8. Subchloride of Bismuth; Pearl Powder; *Bismuthi Subchloridum* (L.).

Bismuth Chloride:—$BiCl_3$. Terchloride of Bismuth; Butter of Bismuth.

Bismuth Hydroxide:—$BiHO_2$.

Bismuth Subnitrate:—$BiONO_3$. Basic Nitrate of Bismuth; Pearl White; Flake White; *Blanc de Fard* (Fr.); *Bismuthi Subnitras* (L.).

Bismuth (Normal) Nitrate:—$Bi(NO_3)_3,5H_2O$. Neutral Nitrate; Ternitrate.

Bismuth Trioxide: — Bi_2O_3. Bismuthous Oxide; Teroxide of Bismuth; Protoxide of Bismuth.

Bismuth Pentoxide:—Bi_2O_5. Bismuthic Oxide; Bismuthic Anhydride; Bismuthic Acid.

Bismouthous Sulphide:—Bi_2S_3. [Bismuthinite; Bismuth Glance].

Boracic Acid:—$B(OH)_3$. Boric Acid; Hydrogen Borate; Sedative Salt; *Acidum Boracicum* (L.); Sedative Salt of Vitriol.

Boric Acid:—See Boracic Acid above.

Boric Anhydride:—B_2O_3. Boric Oxide; Borocic Anhydride; Anhydrous Boracic Acid.

Borate:—*Boras* (L.).

Borax:—$Na_2B_4O_7,10H_2O$. Biborate of Soda; Pyroborate of Soda; Borate of Soda; Subborate of Soda; [Tincal].

Boron:—B.

Boron Trisulphide:—B_2S_3.

Boron Nitride:—BN.

Bromide:—*Bromidum* (L.); Bromuret; Hydrobromate.

Bromine:—Br. *Brominium* (L.); *Brôme* (Fr.).

Cadmium:—Cd. Klaprophium.

Cadmium, Carbonate of:—$CdCo_3$. *Cadmii Carbonas* (L.).

Cadmium, Chloride of:—$CdCl_2$. Muriate of Cadmium; Hydrochlorate of Cadmium; *Cadmii Chloridum* (L.).

Cadmium, Iodide: — CdI_2. Hydriodate of Cadmium; *Cadmii Iodidum* (L.).

Cadmium, Oxide:—CdO. Protoxide of Cadmium; *Cadmii Oxydum* (L.).

Cadmium, Sulphate: — $CdSO_4.4H_2O$. *Cadmii Sulphas* (L.).

Cadmium, Sulphide.—CdS. Cadmium Yellow; [Greenockite].

Caffeine:—$C_8H_{10}N_4O_2.H_2O$. Théine; *Caffeina* (L.).

Calcium:—Ca.

Calcium Acid Phosphate:—$CaH_4,2PO_4$. Soluble acid Phosphate; Superphosphate of Lime.

Calcium Bromide.-$CaBr_2$. *Calcii Bromidum* (L.)

Calcium Carbonate:—$CaCO_3$. *Calcii Carbonas* (L.); Creta Præcipitata; [Chalk; Limestone; Marble; Calcite; Calc Spar].

Calcium Chloride:—$CaCl_2$. *Calcii Chloride; Calcii Chloridum* (L.). Muriate of Lime; Fixed Ammoniacal Salt; Chlorinated Lime; Bleaching Powder; Calcium Hypochlorite. These three are really a mixture $CaCl_2 + CaCl_2O_2$.

Calcium Fluoride:—CaF_2. Hydrofluorate of Lime; [Fluorite].

Calcium Hydroxide:—$Ca(OH)_2$; Calcic Hydrate; Lime Water; *Liquor Calcis* (L.).

Calcium Iodide:—CaI_2. Hydriodate of Lime; *Calcii Iodidum* (L.).

Calcium Monoxide:—CaO; Lime; Calcic Oxide.

Calcium Dioxide:—CaO_2.

Calcium Nitrate:—$Ca(NO_3)_2$; Lime Saltpeter.

Calcium Phosphate:—$Ca_3(PO_4)_2$. *Calcii Phosphas* (L.); Tricalcic Phosphate.

Monocalcic Orthophosphate:—$CaHPO_4$.

Tetrahydro-Calcic Phosphate:—$H_4Ca(PO_4)_2$.

Calcium Phosphide:—P_2Ca_2. Phosphuret of Lime; *Calcii Phosphuretum* (L.).

Calcium Hypophosphite:—$Ca(PO_2H_2)_2$.

Calcium Sulphate:—$CaSO_4.2H_2O$. *Calcii Sulphas* (L.); [Gypsum; Calcic Sulphate; Plaster of Paris; Selenite]; Calcic Sulphate; Bihydrate of Lime.

Calcium Protosulphide:—CaS. Calcium Monosulphide.

Calcium Bisulphide:—CaS_2.

Calcium Pentasulphide:—CaS_5.

Calcium Sulphide:—CaS. Calcium, Sulphuret of; Calcium Monosulphide.

Camphor:—$C_{10}H_{16}O$. Camphire; Laurel Camphor; *Camphora*, (L.).

Carbolic Acid:—C_6H_6O. Phenol; Phenyl Alcohol; Phenic Acid; Phenylic Acid; Phenylic Alcohol; Hydrate of Phenyle; Coal Tar Creosote; Six Carbon Phenol; Hydrated Oxide of Phenyle; *Acidum Carbolicum* (L.).

Capric Acid:—$HC_{10}H_{19}O_2$. Rutic Acid; *Acidum Capricum* (L.).

Carbon:—*Carbo* (L.); *Carbone*, (Fr.); *Kohlenstoff* (Ger.).

Carbon Monochloride:—C_2Cl_2. Subchloride of Carbon.

Carbon Protochloride:—C_2Cl_4. Carbon Dichloride; Tetrachlorethane.

Carbon Sesquichloride:—C_2Cl_6. Trichloride of Carbon; Hexchlorethane; Perchloride of Carbon.

Carbon Tetrachloride:—CCl_4. Bichloride of Carbon; Tetrachloromethane.

Carbon Oxychloride:—$COCl_2$. Phosgene Gas; Chlorocarbonic Acid; Chloride of Carbonyl.

Carbon Monosulphide:—CS.

Carbon Sulphide:—CS_2. Carbon Disulphide; Carbon Bisulphide; Bisulphide of Carbon; Sulphuret of Carbon; *Carbonei Bisulphidum* (L.); Bisulphuret of Carbon; Sulpho-carbonic Acid.

Carbon Oxysulphide:—COS. Carbonyl Sulphide.

Carbonic Anhydride:—CO_2. Carbonic Acid; Carbon Dioxide; Choke Damp.

Carbonic Oxide:—CO. Carbon Monoxide; Protoxide of Carbon; Gaseous Oxide of Carbon.

For other carbon compounds see **Acetyline, Olefiant Gas.**

Cerin:—$HC_{27}H_{53}O_2$. Cerotic Acid.

Cerotic Acid:—See Cerin.

Cetin:—$C_{32}H_{64}O_2$.

Cetraric Acid:—$C_{18}H_{16}O_8$. Cetrarin.

Chalk:—Calcium Carbonate; Carbonate of Lime.

Chloral Hydrate: —C_2HCl_3O.Aq. Hydrate of Chloral; Chloral.

Chlorate:—Hyperoxymuriate; *Chloras* (L.).

Chloride:—Chloruret; *Cl dum* (L.).

Chloride of Lime:—B hing Powder; often called Calcium Chloride, (improperly).

Chlorine:—Cl. *Chlorinum* (L.); *Chlore* (Fr.); *Chlor* (Ger.).

Hydrochloric Acid:—HCl. See **Hydrochloric Acid.**

Hypochlorous Acid:—HClO.

Chlorous Acid:—$HClO_2$. *Acidum Chlorosum* (L.).

Chloric Acid:—$HClO_3$. Hyperoxymuriatic Acid; *Acidum Chloricum* (L.).

Perchloric Acid:—$HClO_4$.

Chloroform:—$CHCl_3$. Chloroformyl; Methenyl Chloride; Terchloride of Formyle; Formyle - Chloride; Terchloromethane; *Chloroformum* (L.); Perchloride of Formyle; Tri-chloro-methane.

Chromate:—*Chromas* (L.); for Potassium Dichromate, etc., see **Potassium,** etc.

Chromium:—Cr.

Chromous Chloride:—$CrCl_2$. Protochloride.

Chromic Acid:—CrO_3. Chromic Anhydride; Chromium Trioxide; *Acidum Chromicum* (L.); Anhydrous Chromic Acid.

Chromic Chloride:—Cr_2Cl_6. Sesquichloride.

Chromyl Dichloride:—CrO_2Cl_2. Chromium Dioxydichloride; Chlorochromic Acid.

Chromous Oxide:—CrO. Protoxide of Chromium; Monoxide of Chromium; Green Oxide of Chromium; Chrome Green.

Chromic Oxide:—Cr_2O_3. Sesquioxide.

Trichromic Tetroxide:—Cr_3O_4.

Chromic Anhydride:—CrO_3. Chromic Acid; Chromic Trioxide; Anhydrous Chromic Acid.

Citric Acid:—$C_6H_8O_7$ or $C_3H_4(OH)_2(CO_2H)_2$. Acid of Lemons; *Acidum Citricum* (L.); Salt of Lemons.

Cobalt:—Co. Regulus of Cobalt; *Cobaltum* (L.).

Cobalt Acetate:—$Co(C_2H_3O_2)_2$.

Cobalt Arseniate:—$Co_32AsO_3,8H_2O$.

Cobalt Carbonate:—$CoCO_3$.

Cobalt Chloride:—$CoCl_2$. Muriate of Cobalt; Hydrochloride of Cobalt; Dichloride; Cobaltous Chloride.

Cobalt Trichloride:—Co_2Cl_6; Cobaltic Chloride.

Cobalt Nitrate:—$Co(No_3)_2$; Cobaltous Nitrate.

Cobalt Oxalate:—CoC_2O_4.

Cobalt Protoxide:—CoO. Oxide of Cobalt; Cobalt Black; Gray and Black Oxide of Cobalt; Cobalt Monoxide; Cobaltous Oxide; [Asbolite].

Cobalt Sesquioxide:—Co_2O_3. Peroxide of Cobalt; Cobaltic Oxide.

Coboltoso-Cobaltic Oxide:—Co_3O_4.

Cobalt Phosphate:—$Co_3(PO_4)_2$.

Cobalt Sulphate:—$CoSO_4$.

Cobalt Sulphide:—CoS. Bisulphide, CoS_2; Sesquisulphide, Co_2S_3.

Copper:—Cu. *Cuprum* (L.).

Copper, Acetate:—$Cu(C_2H_3O_2)_2$. Neutral or Normal Acetate of Copper; Crystallized Verdigris; Crystals of Venus.

Copper, Basic Acetates:—Sub-Acetates of Copper; Basic Cupric Acetates.

Copper, Ammonio-Sulphate of:—$(N_2H_8Cu)SO_4$. Sulphate of Cupra-Ammonium; Cupro-Sulphate of Ammonia; *Cupri Ammonio-Sulphas* (L.).

Copper Arsenite:—$Cu(AsO_2)_2$. Scheele's Green.

Copper Carbonate:—$CuCO_3$, CuH_2O_2. Dibasic Carbonate of Copper; Dicarbonate of Copper [Malachite]; Green Copper Carbonate.

Cuprous Chloride:—CuCl. Dichloride of Copper; Subchloride of Copper.

Copper Chloride:—$CuCl_2$. Neutral Chloride of Copper; Cupric Chloride.

Copper Oxychloride:—$CuCl_2.3CuO.4H_2O$.

Cuprous Hydride:—Cu_2H_2.

Cupric Iodide:—CuI_2. Iodide of Copper; Diniodide of Copper.

Cupric Nitrate:—$Cu(NO_3)_2,3H_2O$. Nitrate of Copper; *Cupri Nitras* (L.).

Cuprous Oxide:—Cu_2O. Red Oxide of Copper; Dinoxide; Sub-oxide; *Cupri Suboxydum* (L.); [Cuprite; Red Copper Ore.]

Cupric Oxide:—CuO. Protoxide of Copper; Oxide of Copper; Black Oxide of Copper; *Cupri Protoxydum* (L.); [Melaconite].

Copper Phosphide:—Cu_3P_2.

Cupric Sulphate:—$CuSO_4.5Aq$. Sulphate of Copper; Blue Vitriol; Blue Copperas; *Cupri Sulphas* (L.); Blue Stone; Roman Vitriol; [Chalcontrite.]

Copper Sulphide:—CuS. Cupric Sulphide.

Cuprous Sulphide:—Cu_2S. Copper Subsulphide; [Chalcocite; Chalcocine; Vitrious Copper; Copper Glance].

Copperas, Blue:—Copper Sulphate of Copper.

Copperas, Green:—Iron Sulphate.
Copperas, White:—Zinc Sulphate.

Creosote :—See **Kreasote.**

Eau (Fr., Water:—See also **Aqua.**
Eau de Mer:—Salt of Sea Water.
Eau Distillée:—Distilled Water.
Eau de Vie:—Brandy; Aqua Vitæ.
Eau Forte:—Nitric Acid.

Eikonogen :—Eiko.

Ether:—$(C_2H_5)_2O$. or $C_4H_{10}O$. Oxide of Ethyl. See **Ethyl.**

Ethyl :—C_2H_5. Ethyle; *Æthyle* (L.); Etnule.
Ethyl Acetate:—$C_2H_5C_2H_3O_2$. Acetic Ether; Pyroligneous Ether; Acetate of Oxide of Ethyl, or Ethule; *Æther Aceticus* (L.).
Ethyl Benzoate:—$C_2H_5C_7H_5O_2$. Benzoic Ether; Benzoate of Ether; *Æther Benzoicus* (L.).
Ethyl Bromide:—C_2H_5Br. *Æther Hydrobromicus* (L.); Bromethane Hydrobromic Ether.
Ethyl Butyrate:—$C_2H_5C_4H_7O_2$. Pineapple Oil; Butyric Ether.
Ethyl Carbonate:—$(C_2H_5)_2CO_3$. Carbonic Ether; Carbonate of Oxide of Ethyl; *Æther Carbonicus* (L.).
Ethyl Chloride:—C_2H_5Cl. Chloride of Ethyl; Light Hydrochloric Ether; *Æther Hydrochloricus* (L.); Chlorethane; Hydrochloric Ether; Muriatic or Chlorhydric Ether.
Ethyl, Cyanide of:—C_2H_5CN. *Æther Hydrocynicus* (L.); Propionitrile.
Ethyl, Cyanate of:—C_2H_5CNO. Cyanic Ether; Cyanate of Oxide of Ethyl.
Ethyl, Cyanurate of:—$(C_2H_5)_3C_3N_3O_3$. Cyanurate of Oxide of Ethyl.
Ethyl Iodide:—C_2H_5I. *Æther Hydriodicus* (L.). Iodethane Hydriodic Ether.
Ether, Methylic:—C_2H_3O. Oxide of Methyl; Wood-Ether; Methyl-Ethyl; Ethyl-Methyl; Ethyl-Methyl Oxide; Ethel Methyl Ether; Ethyl Methylate; Methyl Ethylate.
Ethyl Nitrate:—$C_2H_5NO_3$. Nitric Ether; Hyponitrous Ether; Nitrite of Ether; Nitrite of Oxide of Ethyl; Hyponitrite of Ethyl; *Æther Nitrosus* (L.).
Ethyl Nitrite:—$C_2H_5NO_2$. Nitrous Ether.
Ethyl, Œnanthate of:—Œnanthic Ether; Pelargonic Ether; Œnanthate of Oxide of Ethyl.
Ethyl Oxalate:—$(C_2H)_2C_2O_4$. Oxalic Ether; Oxalate of Oxide of Ethyl; *Æther Oxalicus* (L.).
Ethyl Oxide:—$(C_4H_{10}O)$. Ether; Sulphuric Ether; *Æther; Æther Sulphuricus*, (L.). Ether; Ethylic Ether; Hydrate of Ether.
Ethyl Phosphates:—$(C_2H_5)H_2PO_4$. Monethylic Phosphate; Phosphovinic Acid; Ethylphosphoric Acid.
Diethylic Phosphate:—$(C_2H_5)_2,HPO_4$. Diethylphosphoric Acid.
Triethylic Phosphate:—$(C_2H_5)_3PO_4$.
Tetrethylic Pyrophosphate:—$(C_2H_5)PO_2$.
Ethyl Phosphites:—Triethyl Phosphite (Symmetrical) $P(O.C_2H_5)_3O$.
Ethylphosphoric Acid:—$(C_2H_5)PO(OH)_2$.
Ethyl Sulphate:—$C_2H_6SO_4$. Acid Ethyl Sulphate; Ethyl Sulphuric Acid; Sulphovinic Acid.

Ferric and **Ferrous** Salts. See **Iron.**

Ferricyanide :—Ferridcyanide; Ferridcyanuret.

Ferricyanogen :—Ferridcyanogen; Ferricyanogen.

Ferrocyanide :—Ferrocyanuret; Prussiate; *Ferrocyanidum* (L.).

Ferrocyanogen :—*Ferrocyanogenium* (L.).

Fluohydric Acid:—Fluoride of Hydrogen.

Fluoride of Hydrogen :—HF. Fluohydric Acid; Hydrofluoric Acid; *Acidum Hydrofluoricum* (L.).

Fluorine :—F. *Fluorinium* (L.).
Fluosilicic Acid:—H_2SiF_6. Hydrofluosilicic Acid; Silicofluoric Acid.

Formate :—Formiate.

Formic Acid :—$HCHO_2$. Hydrogen Formiate

Formobenzoic Acid :—HC_7H_5O,CHO_2. Mandelic Acid; Formiate of Hydride of Benzoyle; Phenylglycollic Acid.

Fusel Oil:—$C_5H_{11}HO$. Fousel Oil; Potato Oil; Oil of Potato Spirit; Grain Oil; Grain Spirit Oil; Marc Brandy Oil; Amylic Alcohol; Hydrated Oxide of Amyl; Amilic Alcohol; Bihydrate of Amilen; Pentylic Alcohol; Isobutyl; Corbinol; Isopentyl Alcohol.

Gallate :—*Gallas* (L.).

Gallic Acid :—$C_7H_6O_5$. *Acidum Gallicum* (L.); Trioxylbenzoic Acid; Dioxysalicylic.

Glycerine :—$C_3H_8O_3$. Glycerin; Hydrated Oxide of Glyceryl; *Glycerinum* (L.); Propenyl Alcohol; Glyceryl.

Gold :—Au. *Aurum* (L.); *Or* (Fr.); *Gold* (Ger.).
Gold Monochloride:—AuCl. Aurous Chloride.
Gold Trichloride:—$AuCl_3$.
Gold Monoxide:—Aurous Oxide.
Gold Trioxide—Au_2O_3. Auric Oxide.
Aurous Sulphide:—Au_2S.
Auric Sulphide:—Au_2S_3.

Guaiacin :—Guaiacic Acid.

Hydracids :—Hydrogen Acids.

Hydriodate :—Iodides.

Hydriodic Acid :—HI. Iodhydric Acid; *Acidum Hydriodicum* (L.); Hydrogen Iodide.

Hydrobromic Acid :—HBr. Hydric Bromide; Hydrogen Bromide.

Hydrobromide :—Bromide.

Hydrochloric Acid :—HCl. Muriatic Acid; Hydrogen Chloride; Hydric Chloride; Chlorydric Acid; Spirit of Salts; Marine Acid.

Hydrochloric Ether:—C_2H_5Cl. Ethyl Chloride; Chloride of Ethyl; Chlorethane; *Æther Hydrochloricus* (L.).

Hydrocyanic Acid:—HCN or HCy. Hydric Cyanide; Cyanhydric Acid; Prussic Acid.

Hydrofluoric Acid:—HF. Hydric Fluoride; Hydrogen Fluoride.

Hydrofluosilicic Acid:—H_2FSiF_6. Fluoride of Silicon and Hydrogen; Silico-fluoric Acid.

Hydrogen:—H. *Hydrogenium* (L.).

Hydrogen, Antimoniureted—SbH_3. Antimoneted Hydrogen; Stibine Hydride of Antimony Stibamine; *Hydrogenium Antimoniatum* (L.); Antimonious Hydride; Stibamine.

Hydrogen Arseniureted:—AsH_3. Arseneted Hydrogen; Hydride of Arsenic; Arsenamine; *Hydrogenium Arseniuratum* (L.).

Hydrogen Carbureted:—CH_4. Carbureted Hydrogen; Marsh Gas; Fire Damp; Gas of the Acetates; Rock Gas.

Hydrogen Suboxide:—H_2O. Water.

Hydrogen Peroxide:—HO or H_2O_2. Hydroxyl; Hydrogen Binoxide; Oxygenated Water; *Hydrogenii Binoxydum* (L.); Deutoxide of Hydrogen.

Hydrogen Phosphureted:—PH_3. Phosphorus Hydride; Phosphoreted Hydrogen; Phosphine; Phosporus Trihydride.

Hydrogen Monosulphide:—H_2S. Sulphureted Hydrogen; Sulphphydric Acid; Hydrosulphuric Acid; Hydric Sulphide; Dihydric Sulphide; Hydrogen Sulphide.

Hydroquinone:—Hydrochinon; Hydrochinone; Hydroquinon; Hydrokinone; Hydro. (contraction); Quinol.

Iodate:—*Iodas* (L.).

Iodide:—Ioduret; Hydriodate; *Iodidum*; *Ioduretum* (L.).

Iodine:—I. Iodatum; *Iodatium* (L.); *Iode* (Fr.); *Iod* (Ger.).

Hydriodic Acid:—HI. Hydrogen Iodide; Iodhydric Acid; *Acidum Hydriodicum* (L.).

Iodic Acid:—HIO_3. *Acidum Iodidum* (L.); Hydrogen Iodate.

Iridine and Hydrogen:—Hydriodic Acid, HI; Iodhyric Acid; *Acidum Hydriodicum* (L.).

Iodoform:—CHI_3. *Iodoformum* (L.).

Iridium:—Ir.

Iridium, Chloride of:—$IrCl_2$. Dichloride.

Iridium, Sesquichloride:—Ir_2Cl_6. Iridium Trichloride · Iridious Chloride.

Iridium Hexachloride:—Ir_2Cl_6.

Iridium, Tetrachloride:—$IrCl_4$. Iridic Chloride.

Iridium Monoxide:—IrO. Hypoiridius Oxide; Iridium Protoxide.

Iridium, Sesquioxide:—Ir_2O_3. Iridious Oxide.

Iridium Dioxide:—IrO_2. Iridic Oxide; Binoxide.

Iridium Trioxide:—IrO_3. Iridium Teroxide.

Iridium Sulphides:—Monosulphide; Sesquisulphide; and Disulphide.

Iron:—Fe. *Ferrum* (L.); *Fer* (Fr.); *Eisen* (Ger.).

Ferric Citrate:—$Fe_2(C_6H_5O_7)_2$. Citrate of Iron; *Ferri Citras* (L.); Prussiate of Iron; Citrate of Sesquioxide of Iron.

Ferric and Ammonium Citrate:—Ammonio-Citrate of Iron; Ammonio-Ferric Citrate; *Ferri et Ammonii Citras* (L.); Citrate of Iron and Ammonium; Ammonio-Ferric Citrate.

Ferric Chloride:—$Fe_2Cl_6,12H_2O$. Perchloride of Iron; Permuriate of Iron; Sesquichloride of Iron; *Ferri Sesquichloridum* (L.); Chloride of Iron; *Ferri Chloridum* [(L.) U. S.].

Ferric and Ammonium Chloride:—$Fe_2Cl_6NH_4Cl.Aq$. Ammonio-Chloride of Iron; Double Chlorides of Iron and Ammonium; *Ferri Ammonium Chloridum* (L.).

Ferric Ferrocyanide:—$Fe_4(FeCy_6)_3.18Aq$. Ferrocyanide of Iron; Prussian Blue; Sesquiferrocyanide of Iron; *Ferri Ferrocyanidum* (L.); Ferrocyanuret of Iron.

Ferric Hydrate:—$Fe_2(HO)_6$. Hydrated Oxide of Iron; Ferrugo; Hydrated Oxide of Iron; Moist Peroxide of Iron; Hydrated Sesquioxide of Iron; *Ferri Oxydum Hydratum* (L.).

Ferric Iodide:—Fe_2I_6. *Ferri Peroxydum* (L.)

Ferric Nitrate:—$Fe_2(NO_3)_3$. Nitrate of Sesquioxide of Iron; Protonitrate of Iron; *Ferri Pernitras* (L.).

Ferric Oxide:—Fe_2O_3. Iron Peroxide; Sesquioxide of Iron; Red Oxide of Iron; *Ferri Sesquioxydum* (L.); Indian Red; Rouge; Jeweler's Red; Crocus; Brown Red; Colcothar; [Hematite; Specular Iron Ore; Red Ocher.]

Ferric Phosphate:—$Fe_2H_3(PO_4)_3$. Ferric Orthophosphare; *Ferri Phosphas*, *Phosphas Ferricus* (L.); Phosphate of Iron.

Ferric Pyrophosphate:—$Fe_6(P_2O_7)_2$. Pyrophosphate of Iron; *Ferri Pyrophosphas* (L.).

Ferric Sulphate:—$Fe_2(SO_4)_3$. Persulphate of Iron; Sulphate of Sesquioxide of Iron; *Ferri Persulphas* (L.).

Ammonio-Ferric Sulphate:—$Fe_2(NH_4)_2SO_4)_4.23H_2O$. Sulphate of Iron and Ammonium; Ammonio-Ferric Alum; *Ferri et Ammonii Sulphas* (L.).

Ferric Sulphide:—Persulphide of Iron.

Ferric Bisulphide:—FeS_2. [Pyrites; Marcasite.]

Double Ferric and Ammonium Tartrate:—Ammonio-Tartrate of Iron; Double Tartrate of Iron and Ammonium; Ammonio-Ferric Tartrate; *Ferri et Ammonii Tartras* (L.); Tartrate of Iron and Ammonium; Ammonio-Ferric Tartrate.

Ferric and Potassium Tartrate:—Ferric Tartrate of Potassium; Ferro-Tartrate of Potassa; Tartrate of Potassa and Iron; *Ferri et Potassii Tartras* (L.); Tartrate of Iron and Potassium; Tartarated Iron; Potassio-Ferric Tartrate.

Ferroso-Ferric Hydrate :—$Fe_3(HO)_6$. Hydrated Magnetic Oxide; Hydrated Ferroso-Ferric Oxide.

Ferroso-Ferric Oxide :—Fe_3O_4. Triferro-tetroxide; Magnetic Oxide of Iron; [Magnetic Iron Ore; Loadstone]; Protosesqui Oxide of Iron; Black Iron Oxide; *Ferri Oxydum Magneticum* (L.).

Ferrous Acetate :—$Fe(C_2H_3C_2)_2$; *Ferri Acetas* (L.).

Ferrous Arseniate :—$Fe_3(AsO_4)_2$. *Ferri Arsenias* (L.); Ferrous Arseniate; Arseniate of Iron.

Ferrous Arsenite :—$Fe(AsO_2)_2$. *Ferri Arsenis* (L.).

Ferrous Bromide :—$FeBr_2$. *Ferri Bromidum* (L.).

Ferrous Carbonate :—F_2CO_3. Protocarbonate of Iron; *Ferri Carbonas; Ferri Subcarbonas* (L.). [Siderite; Spathic Iron Ore.].

Ferrous Chloride :—$FeCl_2$. Protochloride of Iron; Muriate of Iron; *Ferri Chloridum* (L.).

Ferrous Citrate :—$Fe_3(C_6H_5O_7)_2$. Protocitrate of Iron; Citrate of Protoxide of Iron.

Ferrous Ferocyanide : — Ferridcyanide of Iron.

Ferrous Hydrate :—$Fe_2(HO)_2$.

Ferrous Iodide : — FeI_2. Iron Iodide; Protoiodide of Iron; *Ferri Iodidum* (L.); Iodide of Iron.

Ferrous Nitrate :—$Fe(NO_3)_2$. Protonitrate of Iron; Nitrate of Protoxide of Iron; *Ferri Nitras* (L.).

Ferrous Oxalate :—$FeC_2O_4.H_2O$. *Ferri Oxalas* (L.); Oxalate of Iron.

Ferrous Oxide :—FeO. Protoxide of Iron; *Ferri Protoxydum* (L.); Monoxide of Iron.

Ferrous Phosphate :—Phosphate of Iron; Neutral Phosphate of Protoxide of Iron; *Ferri Phosphas* (L.); Bimetallic Ferrous Orthophosphate.

Ferrous Sulphate :—$FeSO_4.7Aq$. Sulphate of Iron; Protosulphate of Iron; Copperas; Green Vitriol; Shoemaker's Black; *Ferri Sulphas* (L.); Iron Vitriol; Protosulphate of Iron; Salt of Steel; Salt of Colcothar.

Ferrous Sulphide :—FeS. Sulphide of Iron; Monosulphide of Iron; Sulphuret of Iron; Protosulphide of Iron; *Ferri Sulphuretum; Ferri Sulphidum* (L.).

Ferrous Tartrate :—*Ferri Tartras* (L.).

Iron Liquor :—Pyrolignite of Iron; Dyer's Acetate of Iron; Black Liquor; Tar Iron; Protacetate of Iron.

Isobutyl. See **Fusel Oil.**

Kinic Acid :—$HC_7H_{11}O_6$. Cinchonic Acid.

Kreasote :—Creasote; Creosote; Kreosote; *Creasotum* (L.).

Lactate :—*Lactas* (L.).

Lactic Acid :—$C_3H_6O_3$. Acid of Milk; *Acidum Lacticum* (L.); Oxypropionic Acid.

Lead :—Pb. *Plumbum* (L.).

Lead Acetate:—$Pb(C_2H_3O_2)_2.3H_2O$. Plumbic Acetate; Sugar of Lead; *Plumbi Acetas* (L.); Salt of Saturn.

Tribasic Lead Acetate: — $Pb(C_2H_3O_2)_22PbO$. Subacetate of Lead; Basic Lead Citrate; Goulard's Acetate of Lead; *Plumbi Subacetas* (L.).

Lead, Arseniate :—$Pb_3(AsO_4)_2$. Arsenate of Lead; *Plumbi Arsenias* (L.).

Lead Bromide :—$PbBr_2$. *Plumbi Bromidum* (L.).

Lead Carbonate:—$PbCO_3$. *Plumbi Carbonas* (L.; see White Lead below); [Cerussite].

Lead Chloride:—$PbCl_2$. Chloride of Lead; *Plumbi Chloridum* (L.).

Lead, Oxychloride :—$(PbCl_2.PbO.)$

Lead Chromate:—$PbCrO_4$. Lemon Yellow; Leipsic Yellow; Paris Yellow.

Lead Dichromate : — $PbCrO_4.PbO$. Chrome Orange; Chrome Red.

Lead Cyanide :—$PbCy_2$. *Plumbi Cyanidum* (L.).

Lead Iodide :—PbI_2. Lead Iodide; *Plumbi Iodidum* (L.).

Lead Nitrate:—$Pb(NO_3)_2$. *Plumbi Nitras* (L.);

Lead Suboxide :—Pb_2O. Diplumbic Oxide.

Lead Oxide :—PbO. Lead Monoxide; Lead Protoxide; Yellow Oxide of Lead; *Plumbi Oxydum* (L.); Litharge; Massicot.

Lead Sesquioxide :—Pb_2O_3.

Lead Red Oxide:—Pb_3O_4. Red Lead; [Minium]; Triplumbic Tetroxide; Plumbate of Oxide of Lead.

Lead Dioxide :—PbO_2. Lead Peroxide; Puce Oxide of Lead.

Lead Sulphate :—$PbSO_4$. *Plumbi Sulphas* (L.); [Anglesite].

Lead Sulphide: — PbS. [Galena]; *Plumbi Sulphide* (L.).

White Lead :—$PbO.H_2O,2(PbO,CO_3)$.

Lime. See **Calcium Dioxide.**

Lithium :—Li.

Lithium Benzoate :—LiC_7H_5,O_2,H_2O.

thium Bromide :—LiBr.

Lithium, Carbonate of:—Li_2CO_3. Carbonate of Lithia; *Lithiæ Carbonas* (L.); Lithic carbonate.

Lithium Citrate :—$Li_3C_6H_5O_7$. *Lithiæ Citras* (L.).

Lithium Hydroxide :—LiHO. Lithia.

Lithium Oxide :—Li_2O.

Magnesium :—Mg. *Magnium* (L.).

Magnesium Bromide :—*Magnesii Bromidum* (L.).

Magnesium Carbonate :— $(MgCO_3)_4.Mg(HO)_2.5H_2O$. (Light.) Carbonate of Magnesia: *Magnesii Carbonas; Magnesia Alba* (L.).

Magnesium Chloride: — $MgCl_2$. *Magnesii Chloridum* (L.).

Magnesium. Citrate of :—$Mg3(C_6H_5O_7)_2$. *Magnesiæ Citras* (L.).

Magnesium. Oxide of :—MgO. Oxide of Magsium; Magnesia; Calcined Magnesia; [Periclastite.]

Magnesium, Phosphate of :—$MgHPO_4.6Aq$. *Magnesiæ Phosphas* (L.).

Magnesium and Ammonium, Phosphate, of:—$MgNH_4.PO_4.6Aq$. Ammonio-Phosphate of Magnesia; *Magnesiæ et Ammoniæ Phosphas* (L.).

Magnesium, Sulphate of:—$MgSO_4.7Aq$. Magnesic Sulphate; Sal Anglicum; Cathartic Salt; Epsom Salt; *Magnesii Sulphas* (L.); Sal Amer; *Sel de Sedlitz* (Fr.); Salt of Canal; [Epsomite]; Bitter Purging Salt.

Magnesium, Sulphite:—$MgSO_3.6H_2O$. *Magnesii Sulphis* (L.).

Magnesium, Tartrate of:—*Magnesii Tartras* (L.).

Magnesium and Potassium, Tartrate of:—Potassio-Tartrate of Magnesia; *Magnesiæ Potassio-Tartras* (L.).

Malic Acid:—$H_3C_4H_3O_5$. *Acidum Malicum* (L.).

Manganese:—Mn. *Manganesium* (L.).

Manganous Acetate:—$Mn(C_2H_3O_2)_2$. Acetate of Protoxide of Manganese; *Manganii Acetas* (L.).

Manganous Carbonate:—$MnCO_3$. Carbonate of Protoxide of Manganese; *Manganesii Carbonas* (L.).

Manganous Chloride:—$MnCl_2$. Dichloride of Manganese; Protochloride of Manganese; Muriate of Manganese; *Manganesii Choridum* (L.); Manganous Chloride.

Manganic Chloride:—Mn_2Cl_6. Trichloride of Manganese.

Manganous Hydrate:—$Mn(HO)_2$. Hydrated Protoxide of Manganese.

Manganous Iodide:—MnI_2. *Manganesii Iodidum* (L.).

Manganous Oxide:—MnO. Protoxide of Manganese; Monoxide.

Manganese Dioxide:—MnO_2. Peroxide of Manganese; Deutoxide of Manganese; Black Oxide of Manganese; [Pyrolusite]; *Mangani Oxidum Nigrum* (L.).

Manganous Manganic Oxide:—Mn_3O_4. Red Oxide of Manganese; Protosesquioxide of Manganese; Trimangano Tetroxide.

Manganese Sesquioxide:—Mn_2O_3. Manganic Oxide.

Manganous Manganic Peroxide:—Mn_4O_7. Intermediate Oxide of Manganese.

Manganous Phosphate:—$MnH.PO_4+6Aq$. Phosphate of Protoxide of Manganese; *Manganesii Phosphas* (L.).

Manganous Sulphate:—$MnSO_4.4H_2O$. Sulphate of Protoxide of Manganese; *Manganesii Sulphas; Mangani Sulphas* (L.).

Manganous Tartrate:—$MnC_4H_4O_6$. *Manganesii Tartras* (L.).

Manganate of Barium:—$Ba(MnO_4)$.

Manganate of Potassium:—K_2MnO_4.

Manganate of Sodium:—$Na(MnO_4)$.

Manganic Acid:—H_2MnO_4.

Manganic Hydrate:—$Mn_2(NO)_6$. Hydrated Sesquioxide of Manganese.

Manganic Oxide:—Mn_2O_3. Sesquioxide of Manganese.

Manganic Peroxide:—MnO_2. Black Oxide of Manganese; Oxide of Manganese; Permanganic Oxide; Binoxide of Manganese; Peroxide of Manganese; *Manganesii Oxidum Nigrum* (L.).

Permanganic Acid:—$H_2Mn_2O_8$.

Permanganate of Potassium:—$K_2Mn_2O_8$ Permanganate of Potash; *Potasii Permanganas* (L.).

Permanganate of Silver:—$Ag(MnO_4)$.

Permanganate of Sodium:—$Na(MnO_4)$.

Permanganic Acid:—$H_2Mn_2O_8$. Hydrogen Permanganate.

Marsh Gas:—See **Hydrogen**, Carbureted.

Mercury:—Hg. Quicksilver; *Hydrargyrum* (L.); *Mercure, Vif Argent* (Fr.); *Quecksilber* (Ger.).

Mercuric Acetate:—$Hg(C_2H_3O_2)_2$. Protacetate of Mercury.

Mercuric Bromide:—$HgBr_2$. Protobromide of Mercury; *Hydrargyri Bibromidum* (L.).

Mercuric Chloride:—$HgCl_2$. Bichloride of Mercury; Corrosive Sublimate; Protochloride of Mercury; Perchloride of Mercury; *Hydrargyri Perchloridum; Hydrargyri Chloridum Corrosivum* (L.); Corrosive Chloride of Mercury; [Horn Quicksilver.]

Mercuric Ammonium Chloride:—$HgNH_3Cl$, Ammonio-Chloride of Mercury; White Precipitate; Cosmetic Mercury; Infusible White Precipitate; Mercurammonium Chloride; Lewery's White Precipitate; *Hydrargyri Ammoniatum* (L.).

Mercuric and Ammonium Chloride:—$NH_4Cl\ HgCl_2$. Chloride of Mercury and Ammonio; Sal Alembroth; Fusible White Precipitate; Mercuro-Diammonium Chloride; *Hydrargyri et Ammonii Chloridum* (L.); Salt of Wisdom.

Mercuric Cyanide:—$HgCy_2$ or $Hg(CN)_2$. Cyanide of Mercury; Bicyanide of Mercury; Prussiate of Mercury; *Hydrargyri Cyanidum* (L.).

Mercuric Iodide:—HgI_2. Red Iodide of Mercury; Protiodide of Mercury; Biniodide of Mercury; *Hydrargyri Iodidum* (L.).

Mercuric and Potassium Iodide:—$HgI_2.KI$. Iodide of Mercury and Potassium; *Hydrargyri et Potassi Iodidum* (L.).

Mercuric and Potassium Iodo-Cyanide:—*Hydrargyri et Potasii Iodo-Cyanidum* (L.).

Mercuric Nitrate:—$Hg(NO_3)_2,2H_2O$. Protonitrate of Mercury; Pernitrate of Mercury.

Mercuric Oxide:—HgO. Monoxide of Mercury; Protoxide of Mercury; Red Precipitate; Binoxide of Mercury; Oxide of Mercury; Red Oxide of Mercury; Yellow Oxide of Mercury; Yellow Mercuric Oxide; Red Mercuric Oxide; Deutoxide of Mercury; Peroxide of Mercury; *Hydrargyri Oxydum* (L.).

Mercuric Sulphate:—$HgSO_4$. Protosulphate of Mercury; *Hydrargyri Sulphas* (L.); Persulphate of Mercury; Precipitated Oxide of Mercury.

Mercuric Sulphide :—HgS. Protosulphide of Mercury; Vermilion; Sulphide of Mercury; Red Sulphide of Mercury; Bisulphide of Mercury; *Hydrargyri Bisulphidum* (L.); [Cinnabar]; Red Mercuric Sulphide.

Mercurous Acetate :—$Hg(C_2H_3O_2)$. Subacetate of Mercury; Acetate of Mercury.

Mercurous Bromide :—HgBr. Sub-bromide of Mercury; *Hydrargyrum Bromidum* (L.).

Mercurous Chloride :—HgCl or Hg_2Cl_2. Mercury Chloride; Subchloride of Mercury; Submuriate of Mercury; Protochloride of Mercury; Calomel; *Hydrargyri Subchloridum* (L.).

Mercurous Iodide :—Hg_2I_2. Subiodide of Mercury; Green Iodide of Mercury; *Hydrargyri Iodidum* (L.); Yellow Iodide of Mercury; Protiodide of Mercury.

Mercurous Nitrate :—$(Hg_2)(NO_3)_2,2H_2O$. Subnitrate of Mercury; *Hydrargyri Subnitras* (L.).

Mercurous Oxide :—Hg_2O. Suboxide of Mercury; Gray Oxide of Mercury; Dioxide of Mercury: Protoxide of Mercury; *Hydrargyri Suboxydum* (L.); Black Oxide of Mercury.

Mercurous Phosphate :—*Hydrargyri Phosphas* (L.).

Mercurous Sulphate :—Hg_2SO_4. Subsulphate of Mercury; Sulphate of the Suboxide of Mercury; Protosulphate of Mercury; *Hydrargyri Subsulphas* (L.); Basic Mercuric Sulphate; Yellow Subsulphate; [Turpeth Mineral.]

Mercurous Sulphide :—Hg_2S. Subsulphate of Mercury; *Hydrargyri Subsulphuretum cum Sulphure* (L.); Ethiop's Mineral (Obsolete).

Mercurous Tartrate :—Prototartrate of Mercury; *Hydrargyri Tartras* (L.).

Microcosmic Salt :—$HNa(NH_4)PO_4+4H_2O$. *Sodium-Ammonium Phosphate.*

Molybdenum :—Mo.

Molybdenum Sulphide :—MoS_2. [Molybdenite.]

Murexid :—$C_8N_6H_8O_6$ or $(C_8H_4(NH_4)N_5O_6+H_2O$. Murexide; Purpurate of Ammonium Muriate.

Muriate :—Chloride and Hydrochlorate.

Muriatic Acid :—HCl. Hydrochloric Acid; Spirit of Salts.

Nickel :—Ni. *Nickelium* (L.).

Nickelic Oxide :—Ni_2O_3. Peroxide of Nickel; Sesquioxide of Nickel.

Nickelous Oxide :—NiO.

Nickelous Acetate :—$Ni(C_2H_3O_2)_2$. *Nickelii Acetas* (L.).

Nickelous Carbonate :—$NiCO_3$. *Nickelii Carbonas* (L.).

Nickelous Chloride :—$NiCl_2$. *Nickelii Chloridum* (L.); Nickel Chloride.

Nickelous Hydrate :—$Ni(HO)_2$.

Nickelous Oxalate :—NiC_2O_4. *Nickelii Oxalis* (L.).

Nickelous Oxide :—NiO. Protoxide of Nickel; Monoxide of Nickel.

Nickelous Sulphate :—$NiSO_4.7H_2O$. Sulphate of Nickel.

Nickelous and Potassium Sulphate :—$NiSO_4 K_2SO_4,6Aq$. Double Sulphate of Nickel and Potassium; Sulphides of Nickel; Subsulphide, Ni_2S; Protosulphide, NiS; [Millerite; Capillary Pyrites]; Disulphide, NiS_2.

Nitrate :—*Nitras* (L.).

Niter :—Nitrate of Potassium.

Niter, Sweet Spirits of :—An Alcoholic Solution of Nitrous Ether.

Nitric Acid :—HNO_3. *Aquafortis* (L.); Azotic Acid; *Acidum Nitricum* (L.).

Nitric Acid, Anhydrous :—N_2O_5. Nitric Anhydride.

Nitrobenzol :—$C_2H_5NO_2$.

Nitrogen :—N. Azote; *Nitrogenium* (L.).

Nitrogen Chloride :—NCl_3. Nitrogen Trichloride; Terchloride of Nitrogen.

Nitrogen Iodide :—Ni_2. Nitrogen Tri-iodide; Teriodide of Nitrogen.

Nitrous Oxide :—N_2O. Laughing Gas; Nitrogen Monoxide; Protoxide of Nitrogen; *Nitrogenii Protoxydum* (L.).

Nitric Oxide :—NO. Nitrous Gas; Deutoxide of Nitrogen; Binoxide of Nitrogen; *Nitrogenii Binoxydum* (L.).

Nitrous Anhydride :—N_2O_3. Nitrogen Trioxide; Anhydrous Nitric Acid.

Nitric Peroxide :—NO_2. Peroxide of Nitrogen; Nitrogenous Tetroxide; Hyponitric Anhydride; Hyponitric Acid; Pernitric Oxide.

Nitrogen Pentoxide :—N_2O_5. Anhydrous Nitric Acid; Nitric Anhydride.

Nitro-Glycerine :—Trinitro-glycerine; Glonoin; Nitrate of Glyceryl; Trinitrite; Nitroleum; Fulminating Oil.

Nitro-Hydrochloric Acid :—*Aqua Regia* (L.); Nitro-Muriatic Acid.

Olefiant Gas :—C_2H_4. Ethene Ethylene; Ephene; Elayl; Heavy Carbonated Hydrogen; Hydruret of Acetyl; Etherin.

Oleic Acid :—$HC_{18}H_{34}O_2$. Elaic Acid.

Orpiment. See **Arsenic.**

Osmium :—Os.

Osmium Dichloride :—$OSCl_2$. Osmius Dichloride; Osmium Protochloride; Hypo-Osmious Chloride.

Osmium Tetrachloride :—$OSCl_4$. Osmic Tetrachloride; Osmium Bichloride; Osmic Chloride.

Osmium Dioxide :—OSO_3; Osmious Acid.

Osmium Trioxide :—OSO_3.

Osmium Tetroxide :—OSO_4; Osmic Acid.

Osmium Protoxide :—OsO; Hypo-osmious Oxide.

Osmium Sesquioxide :—Os_2O_3.

Oxalate :—*Oxalis* (L.).

Oxalic Acid :—$H_2C_2O_4$. *Acidum Oxalicum* (L.).

Oxide:—Oxyd; *Oxydum* (L.).

Oxychloride:—Oxichloride; *Oxychloridum* (L.).

Oxycrate:—*Oxycratum* (L.) The old name of a mixture of vinegar, water and honey.

Oxygen:—O. Oxygen Gas; Volatile Air; Empyreal Air; Dephlogisticated Air (Obsolete).

Ozone:—OO_2 or O_3. Oxygen Peroxide.

Palladium:—Pd.

Palladium Dichloride:—$PdCl_2$; Palladious Chloride.

Palladium Tetrachloride:—$PdCl_4$; Palladic Chloride.

Palladious Iodide:—PdI_2.

Palladium Monoxide:—PdO; Palladious Oxide.

Palladium Dioxide:—PdO_2. Palladic Oxide.

Palladious Sulphide:—PdS.

Palmitic Acid:—$HC_{16}H_{32}O_2$.

Perchlorate:—*Perchloras* (L.).

Perchloric Acid:—$HClO_4$.

Periodic Acid:—HOI_4. Hydric Periodate; Hydrogen Periodate.

Petroleum:—Rock Oil; Liquid Bitumen; Oil of Petre.

Phenol:—C_6H_5O. Phenic Acid; Carbolic Acid; Phenyl Alcohol; Coal Tar Creasote; Six Carbon Phenol.

Phenyl:—C_6H_5. The radical of the phenyl series.

Phenylamine:—$C_6H_5H_2N$ or C_6H_7N. Aniline.

Phosgene Gas:—$COCl_2$. Carbonyl Chloride; Oxychloride of Carbon; Chlorocarbonic Acid.

Phosphate:—*Phosphas* (L.).

Phosphide:—Phosphuret.

Phosphite:—*Phosphis* (L.).

Phosphorus:—P. Phosphorus, Amorphous; Red Phosphorus; Allotropic Phosphorus; *Phosphorus Ruber* (L.).

Phosphorus Trichloride:—PCl_3. Phosphorus Terchloride; Phosphorus Chloride.

Phosphorus Pentachloride:—PCl_5. Phosphoric Chloride and Perchloride of Phosphorus; Phosphoric Chloride.

Phosphorus Oxychloride:—PCl_3O. Phosphoric Oxychloride; Phosphoric Monoxychloride.

Phosphorus Hydride:—PH_3. Phosphureted Hydrogen; Hydrogen Phosphide; Phosphorus Trihydride; Phosphine; Phosphureted Hydrogen.

Hypophosphorus Acid:—H_3PO_2.

Phosphorus Trioxide:—P_2O_3. Phosphorus Anhydride; Anhydrous Phosphoric Acid; Phosphorus Oxide.

Phosphorus Pentoxide, Acid:—P_2O_5. Anhydrous Phosphoric Acid; Phosphoric Anhydride; Phosphoric Oxide.

Hypophosphorus Acid:—H_3PO_2.

Phosphorus Acid:—H_2PO_3. Hydrated Phosphorus Acid.

Hypophosphorus Acid:—$H_6P_2O_4$.

Phosphoric Acid, Orthophosphoric Acid:—H_3PO_4. Tryhydric Phosphoric and Tribasic Phosphoric Acid.

Metaphosphoric Acid:—HPO_3. Monobasic Phosphoric Acid; Glacial Phosphoric Acid.

Pyrophosphoric:—$H_4P_2O_7$. Dibasic Phosphoric Acid.

Pitch:—Black Pitch; Boiled Pitch; Stone Pitch; Wood Pitch.

Pitch, Burgundy:—White Pitch; Burgundy Pine Resin.

Pitch, Canada:—Hemlock Gum; Hemlock Pitch.

Pitch, Jew's:—Asphaltum.

Pitch Mineral:—Asphaltum; Bitumen.

Platinum:—Pt. Platina; White Gold; *Platinum* (L.).

Platinous Chloride:—$PtCl_2$. Dichloride of Platinum.

Platinic Chloride:—$PtCl_4$. Chloride of Platinum; Tetrachloride of Platinum; Perchloride of Platinum; *Platini Bichloridum* (L.).

Platinic-Ammonium Chloride:—$Pt(NH_4)_2.Cl_6$. or $PtCl_4 2NH_4Cl$. Ammonio-Chloride of Platinum; Platino-Chloride of Ammonium.

Platinic Potassium Chloride:—PtK_2Cl_6 or $Pt Cl_4 2KCl$. Platino-Chloride of Potassium; Potassio-Chloride of Platinum.

Platinic Sodium Chloride:—$PtNa_2Cl_6$ or $PtCl_4 2NaCl$. Chloride of Platinum and Sodium; Sodio-Chloride of Platinum; Platino-Bichloride of Sodium; *Platini et Sodii chloridum* (L.).

Platinic Oxide:—PtO_2. Binoxide of Platinum; Dioxide of Platinum.

Platinous Oxide:—PtO. Oxide of Platinum; Monoxide of Platinum.

Platinum Gas:—Gaz-Platine; Gillard's Gas.

Plumbago:—Graphite; Black Lead.

Plumbic Acetate:—Lead Acetate.

Plumbic Acid:—Binoxide of Lead.

Plumbum: See **Lead.**

Potash: See **Potassium.**

Potassium:—K. *Kalium* (L.).

Potassium Acetate:—$K(C_2H_3O_2)$. Acetate of Potash; Potassic Acetate; *Potassii Acetas* (L.); Diuretic Salt; Digestive Salt of Sylvius.

Potassium Arseniate:—KH_2AsO_4; Potassium Arsenate; Dipotassic Arsenate; Arseniate of Potassa; Potassium Dihydric Arseniate; Monopotassic Arseniate; *Potassæ Bin Arsenias* (L.); Arsenical Neutral Salt of Macquer.

Potassium Meta-Arsenite:—$KAsO_2$.

Potassium Diarsenite:—$K_4As_2O_5$.

Potassium Borate:—$K_4B_4O_8$. *Potassæ Boras* (L.).

Potassium Borotartrate:—*Potassæ Borotar-*

tras (L.); Soluble Cream of Tartar; *Cremor Tartari Solubilis* (L.).

Potassium Bromide:—KBr. *Potassii Bromidum* (L.).

Potassium Carbonate:—K_2CO_3. Carbonate of Potassa; Potash of Commerce; Pearlash (Impure); Subcarbonate of Potassa; Salt of Tartar; *Potassii Carbonas* (L.); Normal Potassium Carbonate; Dipotassic Carbonate; Potassium utral Carbonate; Salt of Wormwood; Febrifuge Salt of Sylvius.

Potassium Bicarbonate:—$KHCO_3$. Acid Potassium Carbonate; Bicarbonate of Potassa; Hydrogen Potassium Carbonate; *Potassii Bicarbonas* (L.); Monopotassic Carbonate.

Potassium Chlorate:—$KClO_3$. Chlorate of Potash; *Potassii Chloras* (L.); Potassic Chlorate.

Potassium Perchlorate:—$KClO_4$.

Potassium Chloride:—KCl; Chloride of Potassium; Chloride of Potassa; Febrifuge Salt; [Sylvite].

Potassium Chromate:—K_2CrO_4. Chromate of Potassa; Neutral Chromate of Potassa; Monochromate of Potassa; Yellow Chromate of Potassa; Salt of Chrome; *Potassii Chromas* (L.); Potassic Chromate.

Potassium Bichromate:—$K_2Cr_2O_7$. Potassium, Bichromate of; Potassium Dichromate; Potassic Acid Chromate; Red Chromate of Potash; *Potassii Bichromas* (L.); Potassic Dichrome.

Potassium Citrate:—$K_3C_6H_5O_7$. *Potassii Citratis* (L.).

Potassium Cyanate:—KCyO. or KCNO.

Potassium Cyanide:—KCy or KCyN. Cyanide of Potash; Cyanuret of Potassium; *Potassii Cyanidum* (L.); Potassic Cyanide.

Potassium Ethylate:—C_2H_5KO.

Potassium Ferricyanide:—K_3FeCy_6. Ferridcyanide of Potassium; Red Prussiate of Potash; Potassium Ferricyanuret; *Potassii Ferricyanidum* (L.); *Prussias Rubrum*.

Potassium Ferrocyanide:—K_4FeCy_6 or $K_4FeC_6N_6$ or $Fe(CN)_6$. Prussiate of Potash; Yellow Prussiate of Potash; Ferrocyanuret of Potassium; *Potassii Ferrocyanidum* (L.); Potassic Ferro-Cyanide; Ferroprussiate of Potassa.

Potassium Hydrate:—KOH. Potassium Hydroxide Potassa; Potassa Hydrate; Hydrate of Potassa; Caustic Potash; Caustic Potassa; Hydrated Oxide of Potassa; *Potassa Caustica* (L.); Potassic Hydrate.

Potassium Iodate:—KIO_3. *Potassæ Iodas* (L.).

Potassium Iodide:—KI. *Potassii Iodidum* (L.); Potassic Iodide.

Potassium Nitrate:—KNO_3. [Niter]; Saltpetre; Saltpeter; Salt Peter; Salt Petre; Nitrate of Potash; *Potassii Nitras; Kali; Nitratum; Sel Nitri* (L.).

Potassium Nitrite:—KNO_2. Nitrite of Potassa, *Potassæ Nitras* (L.).

Potassium Oxalate:—$K_2C_2O_4$. Neutral Oxalate of Potassa; *Potassæ Oxalas* (L.).

Potassium Hydrogen Oxalate:—HKC_2O_4. Potassium Binoxalate; Salt of Sorrel; Essential Salt of Lemons; *Potassæ Binoxalas* (L.).

Potassium Acid Oxalate:—$KH_3(C_2O_4)_2$. Potassium Trihydrogen Oxalate; Potassium Quadroxalate.

Potassium Oxide:—K_2O. Potassium Monoxide; Anhydrous Potash; Anhydrous Potassa.

Potassium Perchlorate:—K_2ClO_4. *Potassæ Perchloras* (L.).

Potassium Permanganate:—$K_2Mn_2O_8$. Permanganate of Potash; *Potassii Permanganas* (L.).

Potassium Manganate:—K_2MnO_4.

Potassium Phosphate:—K_3PO_4.

Normal Orthophosphate:—K_3PO_4.

Dipotassic Salt:—K_2HPO_4.

Monopotassic Salt:—KH_2PO_4.

Potassium Prussiate:—Red Prussiate (see Potassium Ferricyanide); Yellow Prussiate (see Potassium Ferrocyanide).

Potassium Silicate:—*Potassæ Silicas* (L.).

Potassium Sulphate:—K_2SO_4. *Potassii Sulphas* (L.); Potassic Sulphate; Sulphate of Potassa; Normal Potassium Sulphate; Dipotassic Sulphate; Sal Polychrest; Vitriolated Tartar.

Potassium Bisulphate:—$KHSO_4$. Potassium-Hydrogen Sulphate; Acid Potassium Sulphate; *Potassæ Bisulphas* (L.); Monopotassic Sulphate; Bisulphate of Potash.

Potassium Disulphate:—$K_2S_2O_7$. Potassium Pyrosulphate.

Potassium Sulphide:—Sulphuret of Potassium; Liver of Sulphur; *Potassii Sulphuretum* (L.); Hepar of Sulphur; *Hepar Sulphuris* (L.); Several Sulphides, Mono-, Bi-, Tri-, Tetra- and Penta-Sulphides have the symbols K_2S; K_2S_2; K_2S_3; K_2S_4; K_2S_5; Hydrosulphide or Sulphydrate, KHS.

Potassium Sulphocyanide:—KCNS or KCyS. Sulphocyanuret of Potassium; *Potassii Sulphocyanidum* (L.); Potassic Sulpho-Cyanide; Potassium Sulpho-Cyanate.

Potassium Tartrate:—$K_2C_4H_4O_6$. Tartrate of Potassa; Neutral Tartrate of Potassium; Neutral Tartrate; Soluble Tartrate; *Potassii Tartras* (L.); Vegetable Salt.

Potassium Bitartrate:—$KHC_4H_4O_6$. Argol or Argal (Impure); Cream of Tartar; Supertartrate of Potassium; Acid Tartrate of Potassa; *Potassa Bitartras* (L.); Crystals of Tartar.

Potassium and Sodium Tartrate. See Sodium and Potassium Tartrate.

Precipitate, Red:—Mercuric Sulphate.

Prussian Blue:—Ferrocyanide of Iron; Prussiate of Iron; Cyanuret of Iron; Paris Blue; Berlin Blue.

Purple of Cassius:—Purple Precipitate of Cassius; Gold Prepared with Tin; *Aurum Stanno Paratum* (L.).

Purpurate of Ammonium:—Murexide.

Pyrogallic Acid:—$HC_6H_5O_3$. Pyro; *Acidum Pyrogallicum* (L.); Pyrogallol; Galline.

Pyrophosphoric Acid: — See **Phosphorus.** (Dibasic Phosphoric Acid.)

Pyrotartaric Acid:—$H_2C_5H_4O_4$. Methylsuccinic Acid.

Quartz:—SiO_2. Silicon Dioxide.

Quinidine:—$C_{20}H_{20}O_2N_2,2H_2O$. Quinidia; Conchimine: Cinchinine.

Quinine:—$C_{10}H_{12}ON$. Quina; Quinia.
Quinine Sulphate:—$(C_{20}H_{24}N_2O_2)_2.2H_2SO_4$ 7Aq. Quinine Disulphate; Quinine.

Salicin:—$C_{13}H_{16}O_7$.

Salicyl:—C_7H_4O.

Salicylic Acid:—$H_2C_7H_4O_3$. Ortho-Oxybenzoic Acid.

Salicylous Acid:—$C_7H_6O_2$. Hydrosilicic Acid; Salicylol; Hydride of Salicyl; Meadow Sweet, Artificial Oil of.

Saltpeter: — Potassium Nitrate; which see.

Salts:—See salts in the body of the Encyclopedia; salts of the different chemicals are also given with the other synonyms under the name of the metal.

Selenium:—Se.
Selenic Acid:—H_2SeO_4. *Acidum Selenicum* (L.).
Selenious Acid:—H_2SeO_3.
Selenium Monochloride:—Se_2Cl_2.
Selenium Tetrachloride:—$SeCl_4$.
Seleniureted Hydrogen:—H_2Se. Hydrogen Selenide; Selenieted Hydrogen; Selenhydric Acid.

Silicon:—Si. *Silicium* (L.).
Silica:—SiO_2. Silicon Dioxide; Silicic Anhydride; Silicic Acid; Silex: [Quartz; Chalcedony; Agate; Flint; Opal, etc.]
Silicon Trichloride:—Si_2Cl_6.
Silicic Chloride:—$SiCl_4$. Silicic Tetrachloride.
Silicon Hydrotrichloride:—$SiHCl_3$. Silicic Chloroform.
Silicic Fluoride:—SiF_4. Silicic Tetrafluoride.
Hydrofluosilicic Acid:—Si_42HF. Silicofluoric Acid.
Silicon Disulphide:—SiS_2.
Silicon Monosulphide:—SiS.
Silicon Oxysulphide:—SiSO.

Silver:—Ag. *Argentum* (L.).
Silver Acetate:—$Ag(C_2H_3O_2)$.
Silver Ammonio-Chloride:-Argento-Chloride of Ammonio.
Silver Benzoate:—$AgC_7H_5O_2$.
Silver Bromide:—AgBr. Argentic Bromide.
Silver Carbonate:—Ag_2CO_3. *Argenti Carbonas* (L.).
Silver Chloride:—AgCl. Argentic Chloride; Monochloride of Silver.
Argentous Chloride:—Ag_4Cl_2. Subchloride of Silver; [Cerargyrite; Horn Silver.]
Silver Cyanide:—AgCN. Argentic Cyanide; Hydrocyanate of Silver.
Silver Fluoride:—AgF or Ag_2F_2.
Silver Iodide:—AgI. Argentic Iodide; *Argenti Iodidum* (L.).
Silver Nitrate:—$AgNO_3$. *Argenti Nitras* (L.); Lunar Caustic; Argentic Nitrate.
Silver Dichloride:—Ag_2O_2. *Argenti Suboxydum* (L.).
Silver Oxide:—Ag_2O. Protoxide of Silver; *Argenti Oxydum* (L.); Silver Monoxide; Argentic Oxide.
Argentous Oxide:—Ag_4O.
Silver Sulphate:—Ag_2SO_4. *Argenti Sulphas* (L.).
Silver Sulphide:—Ag_2S. Sulphuret of Silver; *Argenti Sulphuretum* (L.); [Argentite; Vitreous Silver; Silver Glance.]
Silver Hyposulphide:—$Ag_2S_2O_3$; *Argenti Hyposulphis* (L.).

Sodium:—Na. *Natrium* (L.).
Sodium Acetate:—$Na(C_2H_3O_2).3H_2O$. Acetate of Soda; *Sodæ Acetas* (L.).
Sodium Benzoate:—*Sodæ Benzoas* (L.).
Sodium Borate:—$Na_2O(B_2O_3)_2,10H_2O$. Borax; Borate of Sodium; *Sodii Boras* (L.); Pyroborate; Sodium Biborate; [Tincal.]
Sodium Bromide:—*Sodii Bromidum* (L.).
Sodium Carbonate:-$Na_2CO_3.10H_2O$. Carbonate of Soda; Subcarbonate of Soda; Monocarbonate of Soda; *Sodii Carbonas* (L.); Salt of Barilla; Sodic Carbonate; Sal Soda; Washing Soda; Soda Crystals; Salt of Soda; [Natron]; *Sal Sodæ* (L).
Sodium Sesquicarbonate:—$Na_4H_2(CO_3)_3,2H_2O$. Dihydro-tetra Sodic Carbonate.
Sodium Bicarbonate:—$NaHCO_3$. *Sodæ Bicarbonas* (L.); Hydrogen and Sodium Bicarbonate; Monosodic Carbonate; Hydrosodic Carbonate; Sodium Hydrocarbonate.
Sodium Chlorate:—$NaClO_3$.
Sodium Chloride:—NaCl. *Sodii Chloridum; Sodæ Murias* (L.); Common Salt; Marine Salt; [Halite]; Muriate of Soda.
Sodium Hydroxide:—NaOH. Hydrate of Soda; Caustic Soda; *Sodæ Hydras* (L.).
Sodium Hypochlorite:—Chlorinated Soda; Chloride of Soda; *Sodæ Chlorinata* (L.).
Sodium Hyposulphite:—$Na_2S_2O_3.5H_2O$, Hypo; *Sodæ Hyposulphas* (L.); Sodium Thiosulphate.
Sodium Iodide:—NaI. *Sodii Iodidum* (L.).
Sodium Nitrate:—$NaNO_3$. Chilian Saltpeter; Peruvian Saltpeter; Cubic Niter; *Sodæ Nitras* (L.); [Nitratine].
Sodium Nitrite:—*Sodæ Nitris* (L.).
Sodium Oxide:—Na_2O. Anhydrous Soda; Sodium Monoxide.
Sodium Phosphate:—$Na_2HPO_4.12Aq$. Tribasic Phosphate of Soda; Rhombic Phosphate of Soda; *Sodæ Phosphas* (L.); Perlate Salt; Tasteless Salt; Hydrodisodic Phosphaté; Disodic Orthophosphate; Phosphate of Soda.
Sodium-Ammonium Phosphate:—$NaNH_4HPO_4.4H_2O$. Microcosmic Salt; *Sodii et Ammonii Phosphas* (L.).
Sodium Pyrophosphate:-$Na_4P_2O_7+10H_2O$. *Sodæ Pyrophosphas*; (L.). Normal Sodium Pyrophosphate.

Sodium Silicate:—$Na_2Si_4O_9$. Soluble Glass: Water Glass; Quadrisilicate; Tetra-Silicate.
Sodium Sulphate:—$Na_2SO_4.10Aq$. Glauber's Salt; *Sodæ Sulphas* (L.); Wonderful Salt; *Sal Catharticus Glauberi; Sodii Sulphas* (L.); [Thénardite Mirabilite; Glauberite.].
Sodium Acid Sulphate:—$Na_2SO_4,H_2SO_4,3H_2O$. Bisulphate of Soda.
Sodium Sulphite:—Na_2S_3. Sulphite of Sodium; Sodic Sulphite; *Sodii Sulphis* (L.).
Sodium and Potassium Tartrate:—$KNaC_4H_4O_6.4Aq$. Tartrate of Potassium and Soda; Rochelle Salts; Tartarized Soda; *Sodæ Tartaratum; Sodæ Potassæ Tartras* (L.); Salt of Seignette; Tartarated Soda.
Spirit:—Amylic. See **Fusel Oil.**
Spirit of Hydrochloric Ether:—Spirit of Muriatic Ether; *Æther Hydrochloricus Alcoholicus* (L.).
Spirit of Nitric Ether:—Sweet Spirit of Niter; Spirit of Nitrous Ether; Nitrous Ethereal Spirit; Niter Drops; *Spiritus Ætheris Nitrici* (L.).
Spirit Pyroacetic:—Acetone; *Spiritus Pyroaceticus* (L.).
Spirit Pyroxylic:—Pyroligneous Spirit; Wood Spirit; Wood Naphtha; Hydrated Oxide of Methyl; Medicinal Naphtha; *Spiritus Pyroxylicus* (L.).
Spirit, Rectified:—See Alcohol.
Sirits of Wine:—See Alcohol.
Starch:—$C_6H_{10}O_5$. Amylaceous Fecula; *Amylum* (L.); Amidin.
Stearic Acid:—$HC_{18}H_{35}O_2$. Stearin.
Strontium:—Sr.
Strontium Carbonate:—$SrCO_3$. [Strontanite.]
Strontium Chloride:—$SrCl_2$.
Strontium Nitrate:—$Sr(NO_3)_2$.
Strontium Oxide:—SrO. Strontia; Protoxide of Strontium.
Strontium Dioxide:—SrO_2.
Strontium Sulphate:—$SrSO_4$. [Celestite.]
Sulphate:—*Sulphas* (L.).
Sulphide:—Sulphuret.
Sulphovinic Acid:—$C_2H_5HSO_4$. Sulphethylic Acid; *Acidum Sulphovinicum* (L.).
Sulphur:—S. Brimstone.
Amorphous Sulphur:—Brown Sulphur; *Sulphur Amorphum* (L.).
Liver of Sulphur:—Mixture of Potassium Polysulphides with Potassium Sulphate.
Precipitated Sulphur:—Hydrate of Sulphur; Milk of Sulphur; *Sulphuris Hydras; Lac Sulphuris* (L.).
Roll Sulphur:—Stick Sulphur; Cane Sulphur; *Sulphur in Bacculis* (L.).
Sublimed Sulphur:—Flowers of Sulphur; *Flores Sulphuris* (L.).
Sulphur Vivum:—Black Sulphur; Crude Sulphur; Horse Brimstone; *Sulphur Nigrum* (L.).
Sulphur Mono-Chloride:—S_2Cl_2.
Sulphur Iodide:—S_2I_2. Biniodide of Sulphur; *Sulphuris Iodidum* (L.).
Sulphuret:—Sulphide; *Sulphuretum* and *Sulphidum* (L.).
Sulphuretted Hydrogen:—H_2S. Hydrogen Sulphide; Dihydric Sulphide; Hydric Sulphide; Hydrosulphuric Acid; Sulphydric Acid; Hydrogen Monosulphide.
Sulphur Mono-, Di- and Tri-chlorides:—SCl; SCl_2; SCl_4.
Sulphuric Acid:—H_2SO_4. Oil of Vitriol; Vitriolic Acid; *Acidum Sulphuricum* (L.).
Sulphuric Acid, Anhydrous:—SO_3. Sulphuric Anhydride; Dry Sulphuric Acid.
Sulphuric Acid, Nordhausen:—$H_2S_2O_7$. Fuming Sulphuric Acid: Disulphuric Acid; *Acidum Sulphuricum Fumas* (L.); Pyrosulphuric Acid.
Hydrosulphurous Acid:—H_2SO_2.
Thiosulphuric Acid:—$H_2S_2O_3$. Hyposulphurous Acid.
Dithionic Acid:—$H_2S_2O_6$. Hyposulphuric Acid.
Trithionic Acid:—$H_2S_3O_6$.
Tetrathionic Acid:—$H_2S_4O_6$.
Pentathionic Acid: $H_2S_5O_6$.
Sulphurous Acid:—H_2SO_3. Sulphurous Anhydride; *Acidum Sulphurosum* (L.).
Sulphur Dioxide:—SO_2. Sulphurous Oxide.
Sulphur Trioxide:—SO_3. Sulphuric Oxide; Sulphuric Anhydride; Anhydrous Sulphuric Acid.
Sulphurous Chloride:—$SOCl_2$. Chloride of Thionyl.
Sulphuric Chloride:—SO_2Cl_2. Sulphuryl Chloride; Chlorosulphuric Acid.
Sulphuric Ether. See **Ether.**
Tartar:—Argal; Orgal; *Tartaratum Tartrus* (L.).
Tartar Ammoniated:—Ammonio-Tartrate of Potassa; Soluble Tartar (ammoniated); *Tartras Ammoniatus* (L.).
Tartar Boraxated:—Soluble Cream of Tartar; Boro-Tartrate of Potassium and Sodium; *Tartaratum Boraxatum* (L.).
Tartar Chalybeated:—Potassio-Tartrate of Iron.
Tartar Cream:—Tartrate of Potassium.
Tartar Emetic:—Potassio-Tartrate of Antimony. See **Antimony.**
Tartar Oil:—Deliquesced Carbonate of Potassa.
Tartar Salt:—Carbonate of Potassium.
Tartar Soluble:—Neutral Tartrate of Potassium.
Tartar Spirit:—Pyrotartaric Acid.
Tartaric Acid:—$H_2C_4H_4O_6$ or $C_4H_6O_6$. Acid of Tartar; Essential Salt of Tartar; *Acidum Tartaratum* (L.) Dextrotartaric Acid.
Tellurium:—Te. Tellurium compounds are numerous but are not of much importance.
Hydrogen Telluride:—H_2Te. Hydrotelluric Acid; Tellurated Hydrogen.
Tellurous Acid:—H_2TeO_3.
Telluric Acid:—H_2TeO_4.

Theine :—$C_8H_{10}N_4O_2$. Theine; Caffeine.

Thymol :—$C_{10}H_{13}.OH$. Thymic Acid.

Thymic Acid :—$C_{10}H_{14}O$.

Tin :—Sn. *Stannum* (L.).

Stannous Chloride :—$SnCl_2$. Protochloride of Tin; Dichloride of Tin.

Stannous Chloride Hydrated :—$SnCl_2,2H_2O$. Tin Salt.

Stannous Hydrate :—$Sn(HO)_2$. Hydrated Oxide of Tin.

Stannous Iodide :—SnI_2. Protiode of Tin.

Stannous Oxide :—SnO. Protoxide of Tin; Monoxide of Tin.

Sesquioxide of Tin :—Sn_2O_3.

Stannous Sulphide :—SnS. Protosulphide of Tin.

Stannic Chloride :—$SnCl_4$. Bichloride of Tin; Tetrachloride of Tin; Perchloride of Tin; Permuriate of Tin; *Stanni Bichloridum* (L.); Fuming Liquor of Libavius (with water, forms Butter of Tin).

Stannic Hydrate :—$Sn(HO)_4$. Hydrated Peroxide of Tin; Stannic Acid.

Stannic Iodide :—SnI_4.

Stannic Oxide :—SNO_2. Binoxide of Tin; Peroxide of Tin; Dioxide of Tin; [Cassiterite].

Stannic Sulphide :—SNS_2. Bisulphide of Tin; Bronze Powder; Mosaic Gold; *Aurum Musivum*; *Aurum Mosiacum* (L.).

Tungsten :—W. *Tungstenum; Wolframium* (L.).

Tungsten Trioxide :—WO_3. Tungstic Anhydride; Tungstic Oxide.

Tungstic Acid :—H_2WO_4.

Tungstic Chloride :—WCl_6. Hexachloride.

Tungsten Bisulphide :—WS_2. Tungstous Sulphide; Disulphide.

Tungsten Trisulphide :—WS_3. Tungstic Sulphide.

Vanadium :—V.

Vanadic Binoxide :—V_2O_2. Vanadic Anhydride; Tetroxide of Vanadium; *Acidum Vanadicum* (L.).

Vanadic Oxychloride :—$VOCl_3$. Vanadic Oxytrichloride.

Vermilion :—Red Sulphide of Mercury; Red Sulphuret of Mercury; Factitious Cinnabar.

Vinegar :—*Acetum* (L.).

Water :—H_2O. Protoxide of Hydrogen; Oxide of Hydrogen; *Aqua* (L.); *Eau* (Fr.); *Wasser* (Ger.).

Zinc :—Zn. Zink; Spelter; *Zincum* (L.).

Zinc Acetate :—$Zn(C_2H_3O_2)_2$. *Zinci Acetas* (L.).

Zinc Bromide :—$ZnBr_2$. *Zinci Bromidum* (L.).

Zinc Carbonate :—$ZnCO_3$. *Zinci Carbonas* (L); [Smithsonite].

Zinc Chloride :—$ZnCl_2$. Muriate of Zinc; Butter of Zinc; *Zinci Chloridum* (L.).

Zinc Cyanide : $ZnCy_6$. *Zinci Cyanidum* (L.); Cyanuret of Zinc.

Zinc Oxide :—ZnO. Peroxide of Zinc; Zinc White; [Zincite; Red Zinc Ore].

Zinc Sulphate :—$ZnSO_4.7H_2O$. White Copperas; White Vitriol; *Zinci Sulphas* (L.); Sal. of Vitriol; [Goslarite].

Zinc Sulphide :— ZnS. [Blende; Sphalerite; Black Jack].

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